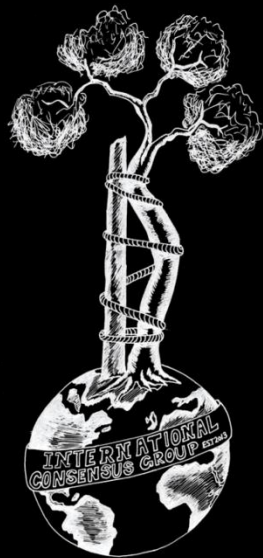


Welcome



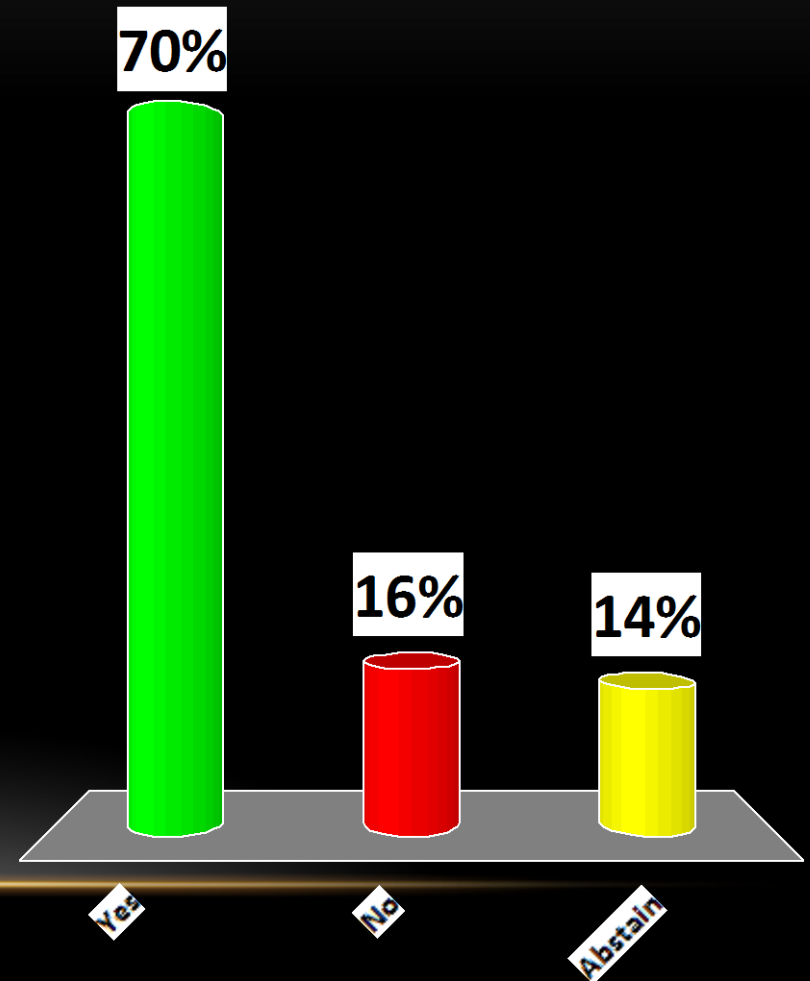
INTERNATIONAL
CONSENSUS MEETING

Test 1: Are you awake?

A. Yes

B. No

C. Abstain

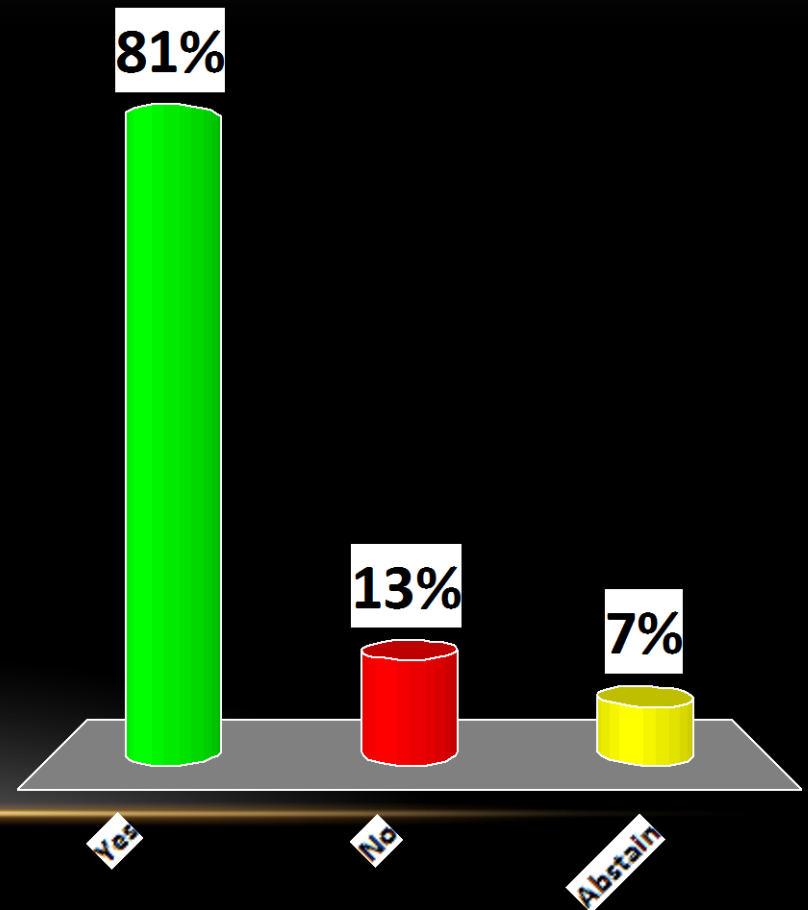


Test 2: Are you Looking forward to today's meeting?

A. Yes

B. No

C. Abstain

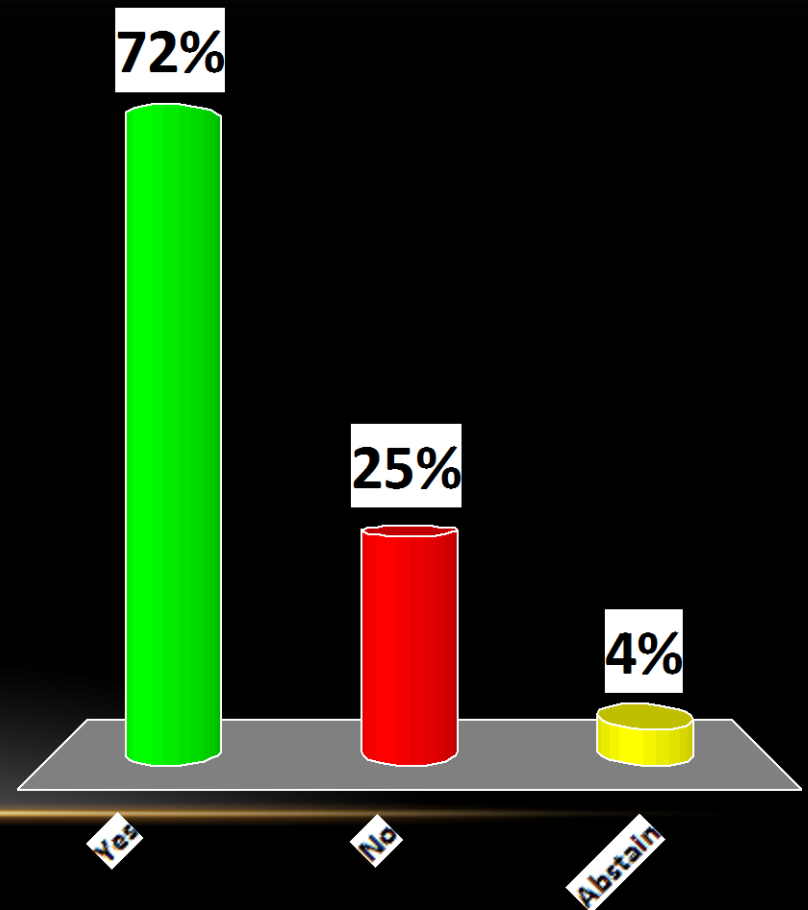


Test 3: Are you coming to dinner tonight?

A. Yes

B. No

C. Abstain



WORKGROUP 1: MITIGATION AND EDUCATION

Liaison: Vinay K. Aggarwal MD, Eric Tischler BS

Leaders: Charles Lautenbach MD (International), Gerald R. Williams MD (US)

Delegates:

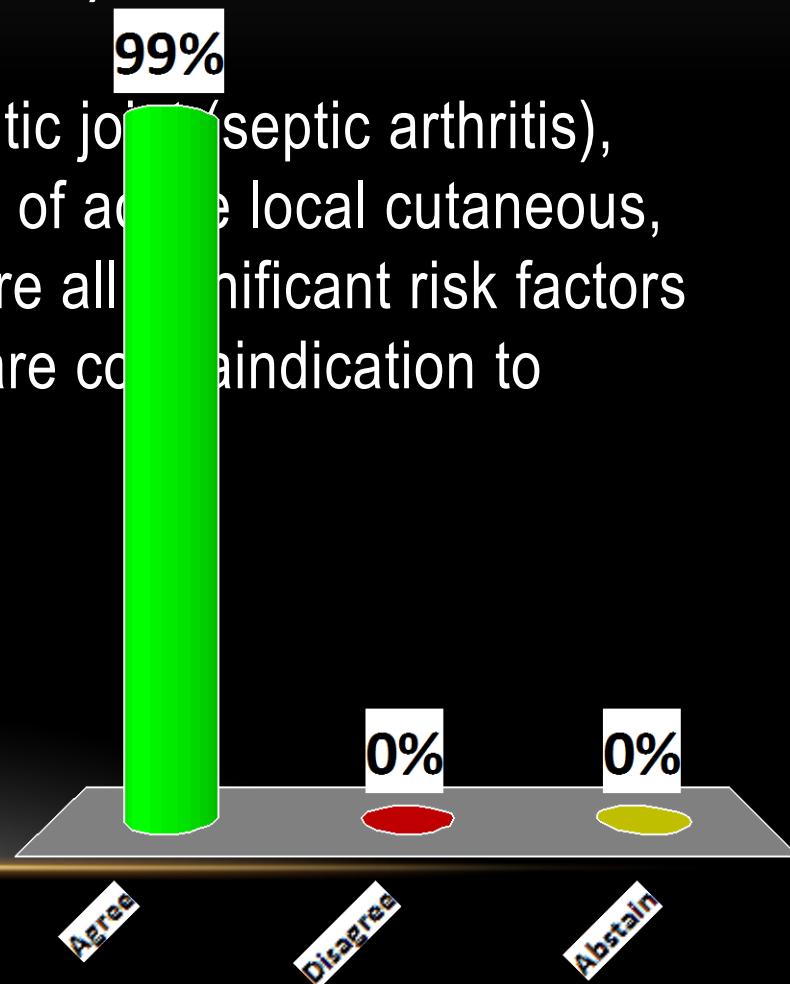
Joseph A Abboud MD, Mark Altena MD, Thomas Bradbury MD, Jason Calhoun MD, FACS, Douglas Dennis MD, Daniel J del Gaizo MD, Luís Font-Vizcarra MD, Kaisa Huotari MD, Stephen Kates MD, Kyung-Hoi Koo PhD, Tad Mabrey MD, Geno Merli MD, Calin Stefan Moucha MD, Julio Cesar Palacio MD, Trisha Nicole Peel MBBS, Rudolf Poolman MD, William J Robb III MD, Thorsten Seyler MD, Gabor Skaliczki MD, T Vasarhelyi MD, William Charles Watters III, MD

WG I

Q1A: What are significant risk factors for development of surgical site infection (SSI) or periprosthetic joint infection (PJI) after elective total joint arthroplasty (TJA)?

Consensus: Active infection of the arthritic joint (septic arthritis), presence of septicemia, and/or presence of acute local cutaneous, subcutaneous, or deep tissue infection are all significant risk factors predisposing patients to SSI or PJI and are contraindication to undertaking elective TJA.

- A. Agree
- B. Disagree
- C. Abstain

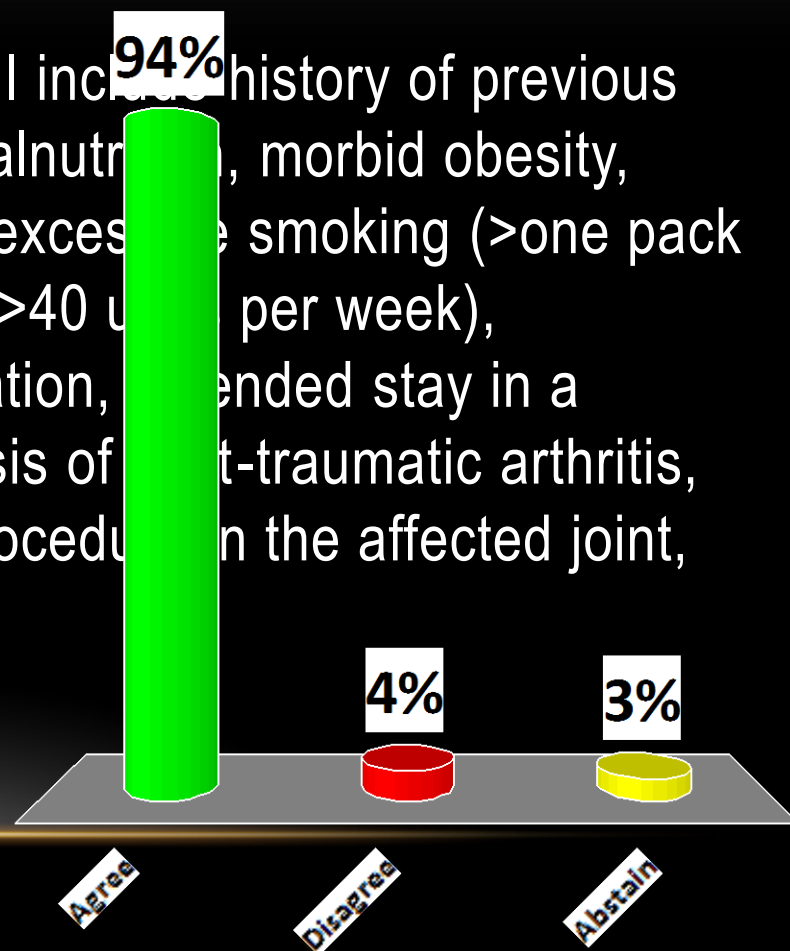


WG I

Q1B: What are significant risk factors for development of surgical site infection (SSI) or periprosthetic joint infection (PJI) after elective total joint arthroplasty (TJA)?

Consensus: The risk factors for SSI or PJI include history of previous surgery, uncontrolled diabetes mellitus, malnutrition, morbid obesity, active liver disease, active renal disease, excessive smoking (>one pack per day), excessive alcohol consumption (>40 units per week), intravenous drug abuse, recent hospitalization, prolonged stay in a rehabilitation facility, male gender, diagnosis of post-traumatic arthritis, inflammatory arthropathy, prior surgical procedure on the affected joint, and severe immunodeficiency.

- A. Agree
- B. Disagree
- C. Abstain

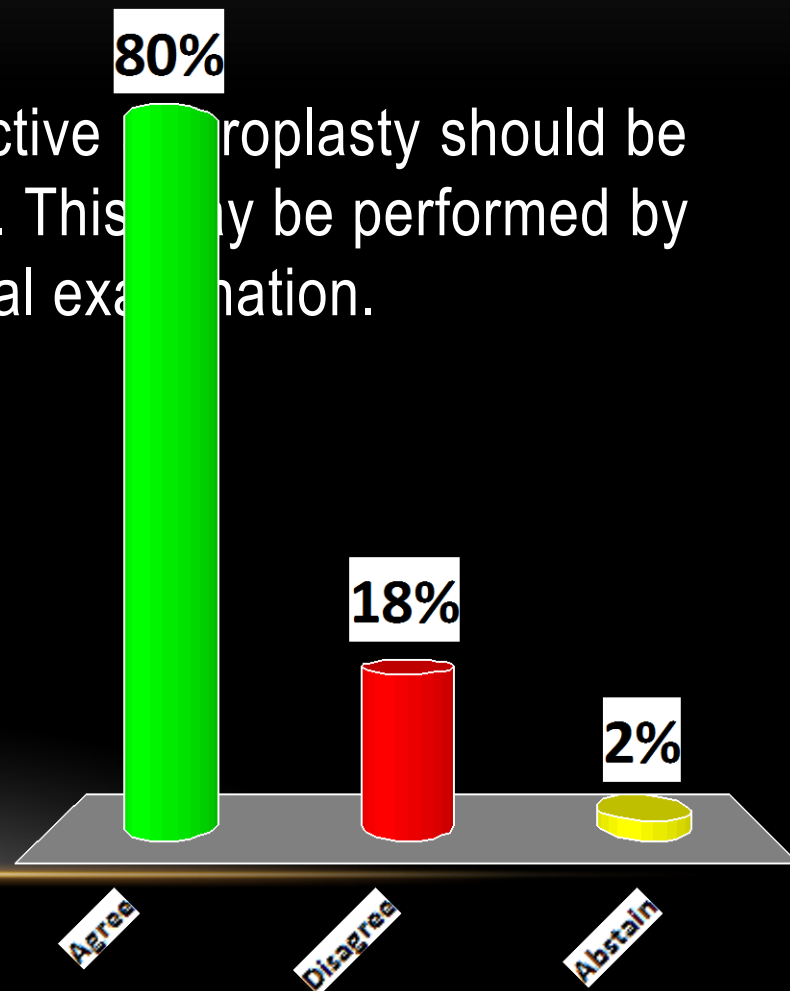


WG I

Question 2: What is the role of oral hygiene for patients undergoing an elective arthroplasty?

Consensus: All patients undergoing elective arthroplasty should be screened for evidence of active infection. This may be performed by administration of a questionnaire or dental examination.

- A. Agree
- B. Disagree
- C. Abstain

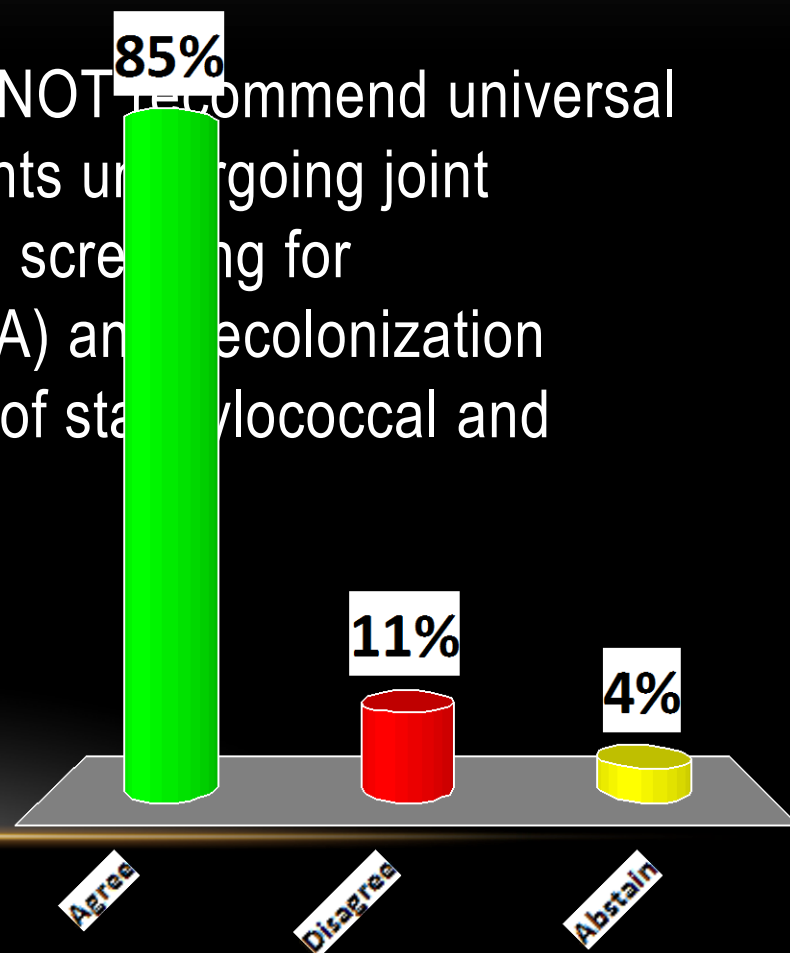


WG I

Question 3A: What should the process be for methicillin-resistant *staphylococcus aureus* (MRSA) and methicillin-sensitive *staphylococcus aureus* (MSSA) screening?

Consensus: While this workgroup does NOT recommend universal screening and decolonization of all patients undergoing joint arthroplasty, it accepts that preoperative screening for *staphylococcus aureus* (MSSA and MRSA) and decolonization decreases the rate of SSI and incidence of staphylococcal and nonstaphylococcal infections.

- A. Agree
- B. Disagree
- C. Abstain

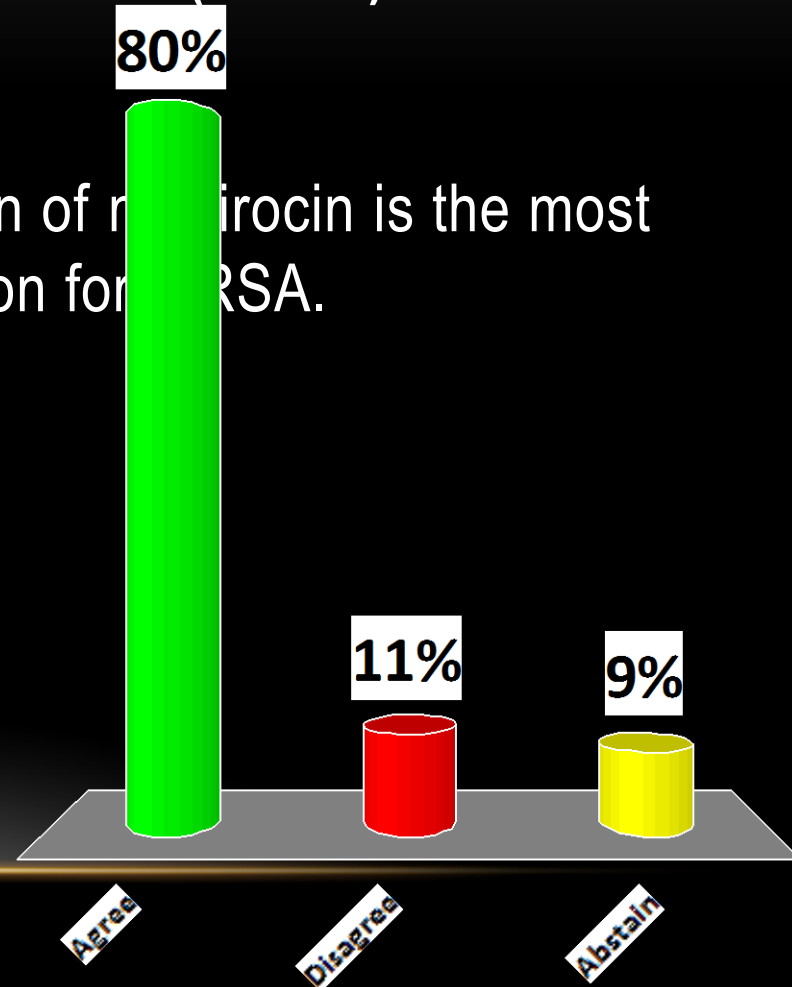


WG I

Question 3B: What should the treatment regimen be for methicillin-resistant *staphylococcus aureus* (MRSA) and methicillin-sensitive *staphylococcus aureus* (MSSA) decolonization?

Consensus: Short-term nasal application of mupirocin is the most accepted current method of decolonization for MRSA.

- A. Agree
- B. Disagree
- C. Abstain

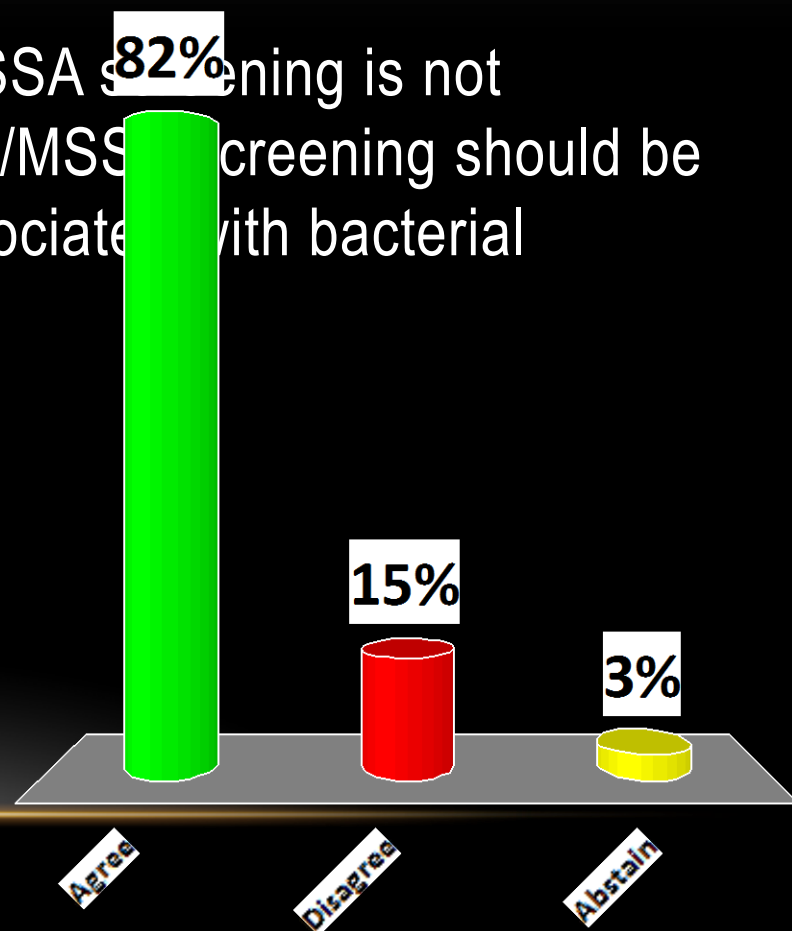


WG I

Question 4: Should healthcare workers be screened for MRSA and MSSA?

Consensus: NO. Routine MRSA and MSSA screening is not warranted for healthcare workers. MRSA/MSSA screening should be reserved for workers with symptoms associated with bacterial infections.

- A. Agree
- B. Disagree
- C. Abstain

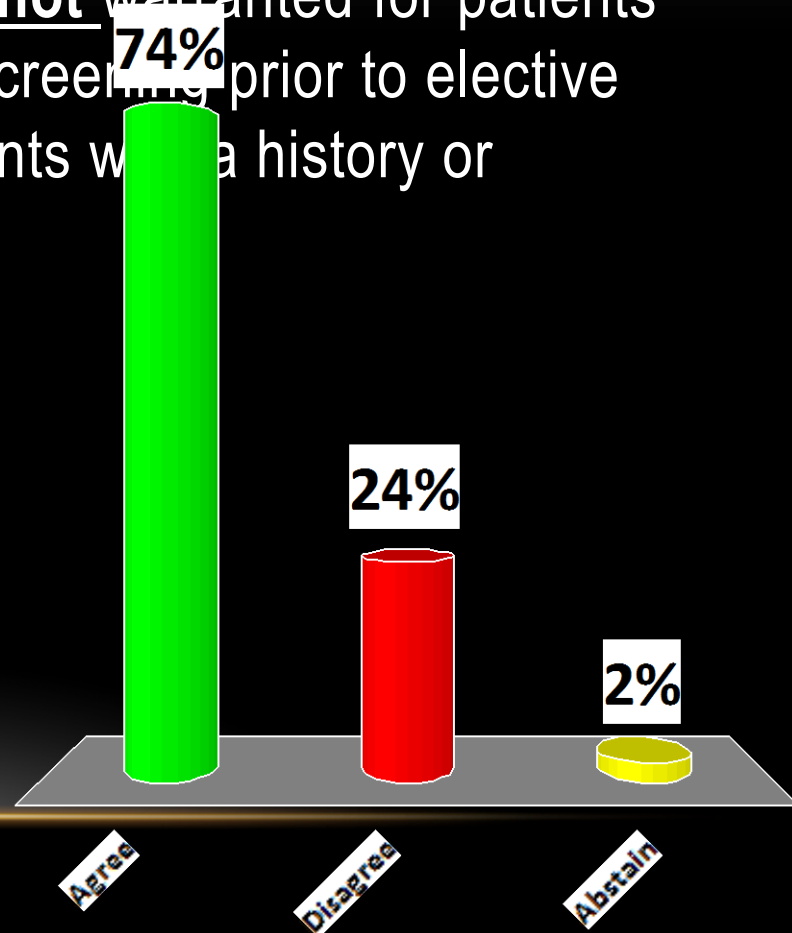


WG I

Question 5: What is the role of routine urine screening in patients undergoing an elective arthroplasty?

Consensus: Routine urine screening is not warranted for patients undergoing elective arthroplasty. Urine screening prior to elective arthroplasty should be reserved for patients with a history or symptoms of urinary tract infection (UTI).

- A. Agree
- B. Disagree
- C. Abstain

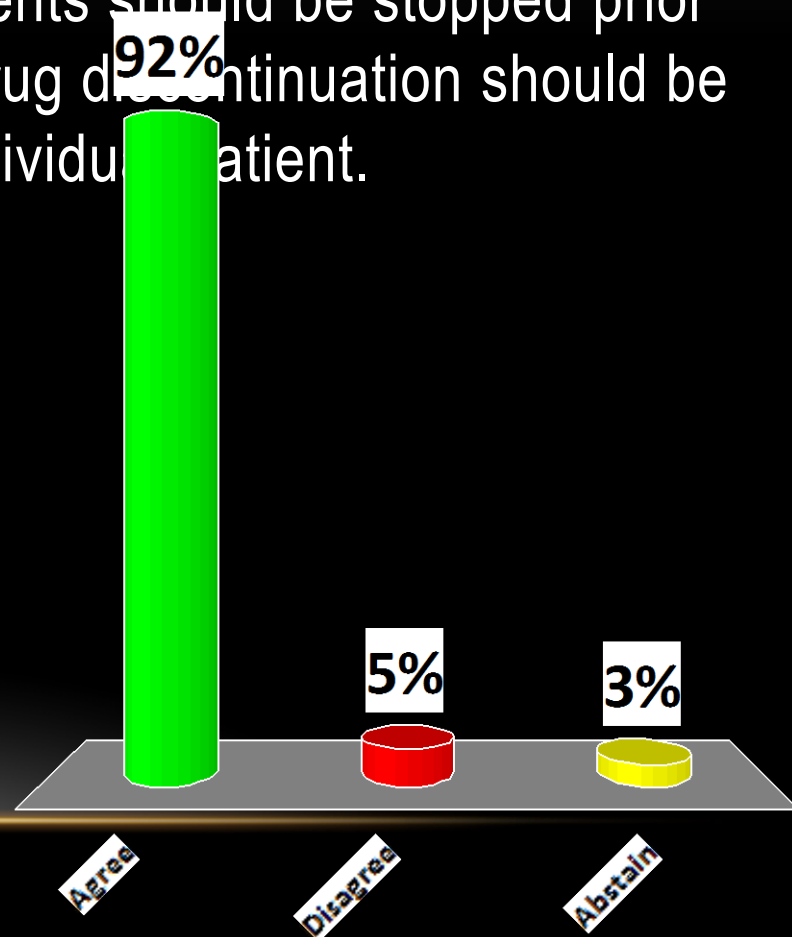


WG I

Question 6: Should disease-modifying agents be stopped prior to elective TJA?

Consensus: Yes. Disease-modifying agents should be stopped prior to elective TJA; however, the timing of drug discontinuation should be based on specific medication and the individual patient.

- A. Agree
- B. Disagree
- C. Abstain

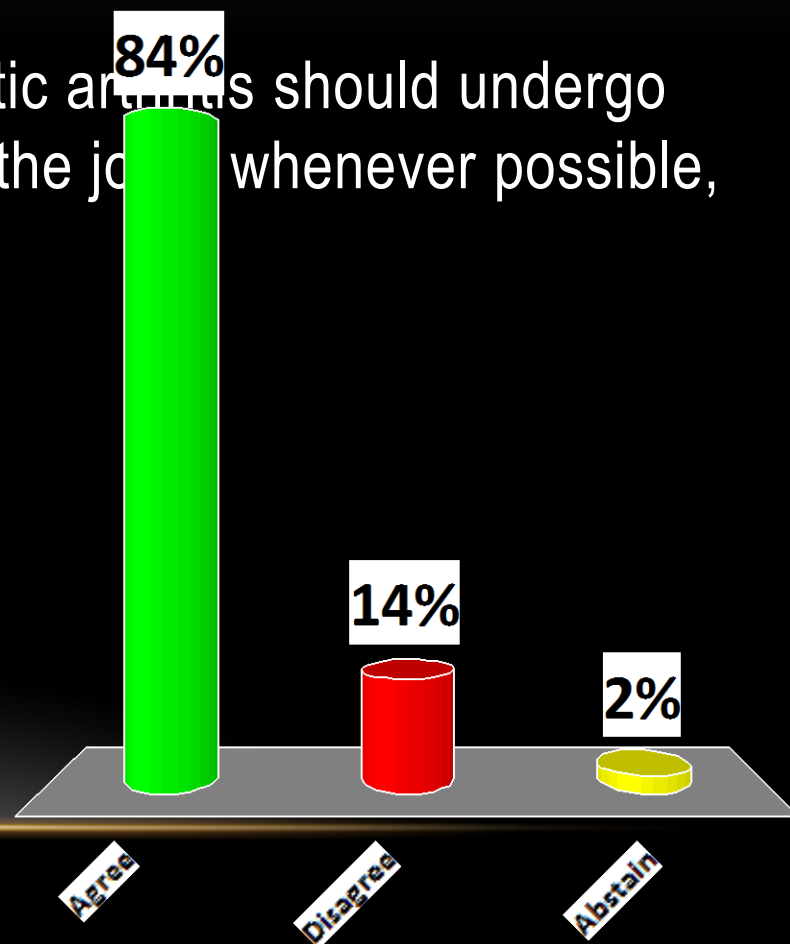


WG I

Question 7A: In patients with prior septic arthritis what strategies should be undertaken to minimize the risk of subsequent PJI?

Consensus: ALL patients with prior septic arthritis should undergo evaluation by serology and aspiration of the joint whenever possible, prior to arthroplasty.

- A. Agree
- B. Disagree
- C. Abstain

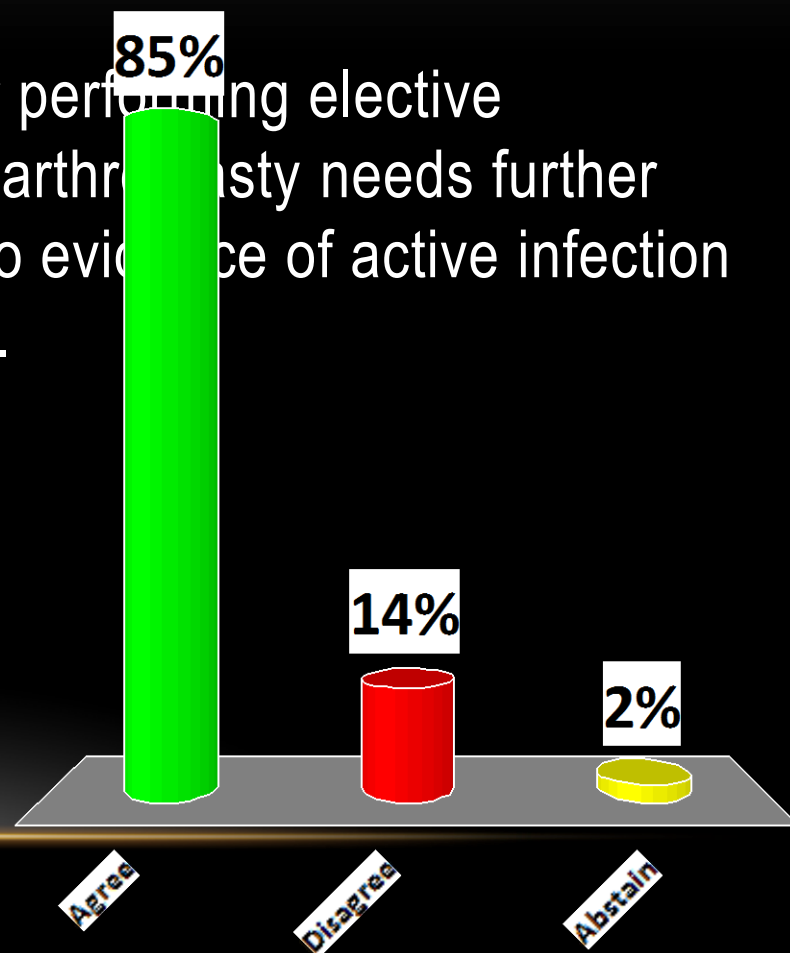


WG I

Question 7B: In patients with prior septic arthritis what strategies should be undertaken to minimize the risk of subsequent PJI?

Consensus: While the optimal timing for performing elective arthroplasty in a patient with prior septic arthritis needs further research, surgeons should ensure that no evidence of active infection exists by taking intraoperative cultures.

- A. Agree
- B. Disagree
- C. Abstain

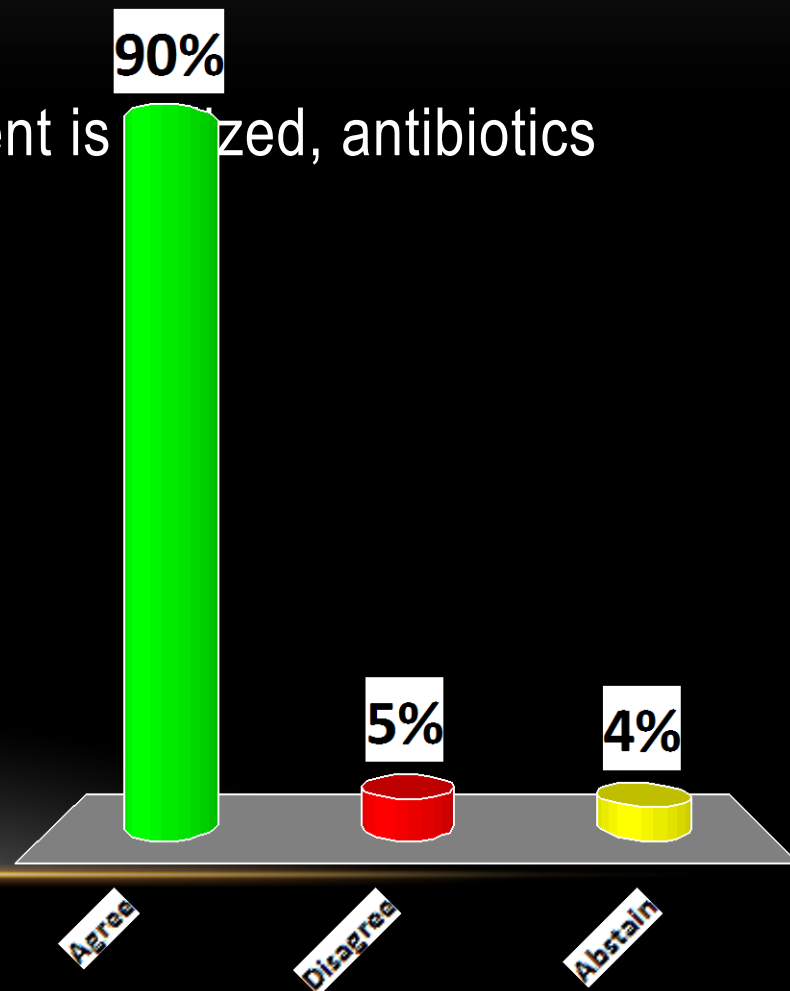


WG I

Question 7C: In patients with prior septic arthritis what strategies should be undertaken to minimize the risk of subsequent PJI?

Consensus: During arthroplasty, if cement is utilized, antibiotics should be added.

- A. Agree
- B. Disagree
- C. Abstain

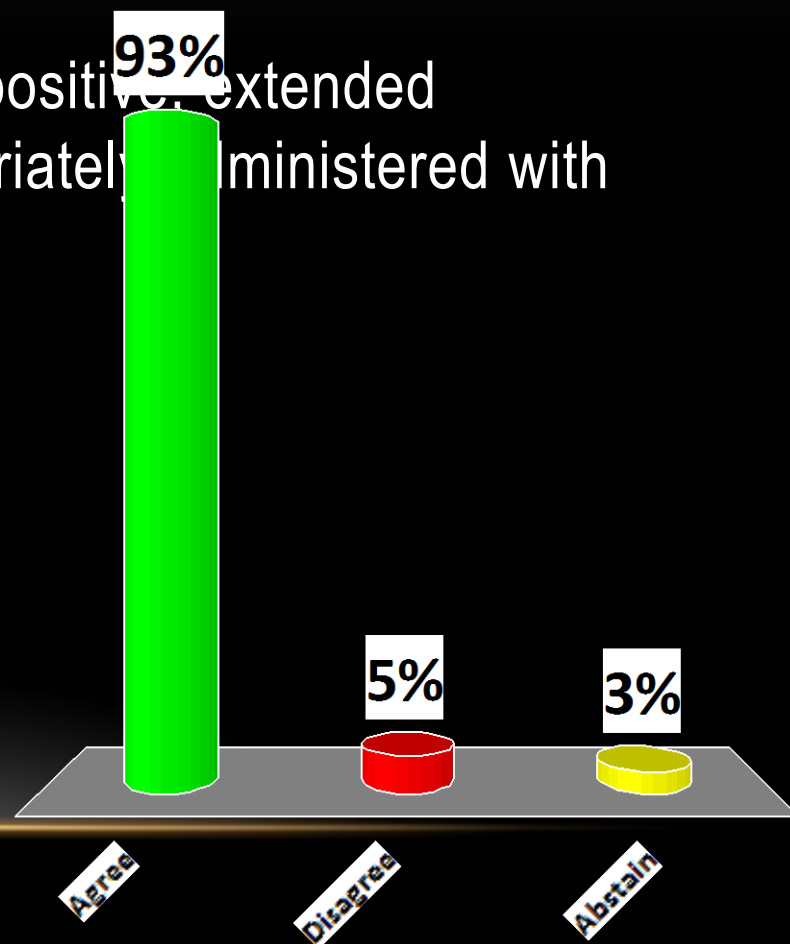


WG I

Question 7D: In patients with prior septic arthritis what strategies should be undertaken to minimize the risk of subsequent PJI?

Consensus: If cultures are found to be positive, extended intravenous antibiotics should be appropriately administered with input from infectious disease specialists.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 2: PERIOPERATIVE SKIN PREPARATION

Liaison: Anthony T. Tokarski BS

Leaders:

Parag Sancheti MS, DNB, MCh (International), David Blaha MD, Michael Mont MD, (US)

Delegates:

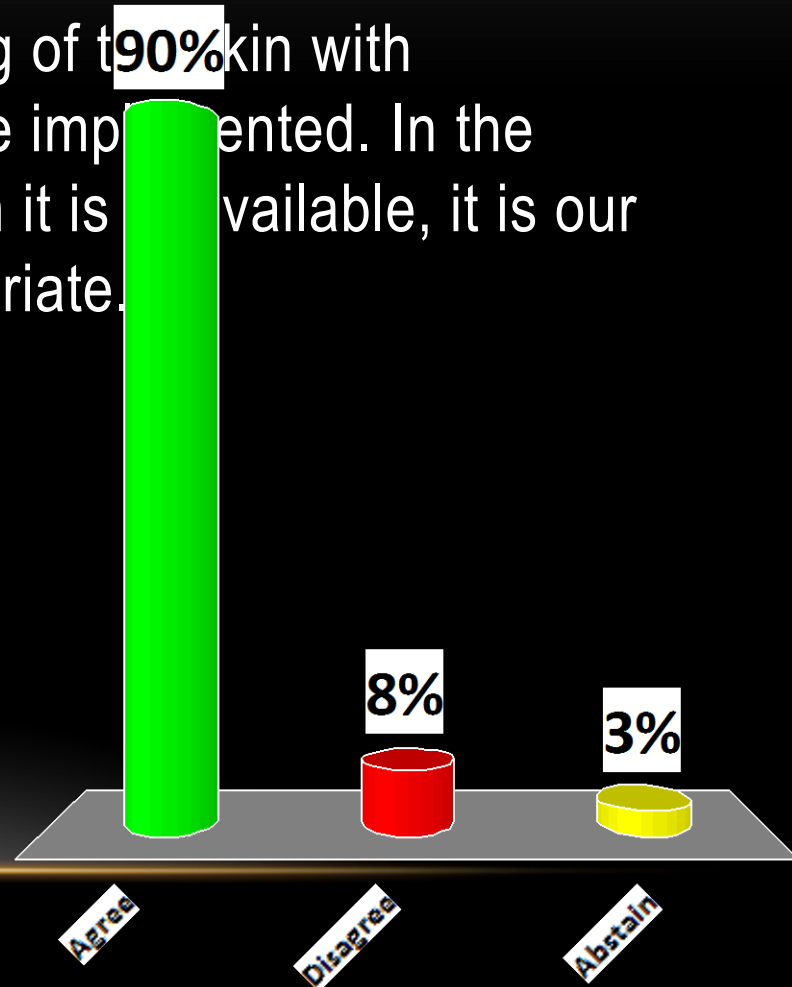
Sandra Berríos-Torres MD, Lyssette Cardona MD, MPH, MHA, AAHIVS, FIDSA, Gilberto Lara Cotacio MD, Mark Froimsm MD, James Kuderna MD, PhD, Juan Carlos López MD, Wadih Matar MD, Joseph McCarthy MD, Rhidian Morgan-Jones MB BCH, FRCS, Michael Patzakis MD, Ran Schwarzkopf MD, Hossan Shahcheraghi MD, Xifu Shang MD, Petri Virolainen MD, PhD, Montri Wongworawat MD, Adolph Yates Jr, MD

WG II

Question 1A: Is there a role for preoperative skin cleansing with an antiseptic?

Consensus: Yes. Preoperative cleansing of skin with chlorhexidine gluconate (CHG) should be implemented. In the presence of a sensitivity to CHG or when it is unavailable, it is our consensus that antiseptic soap is appropriate.

- A. Agree
- B. Disagree
- C. Abstain

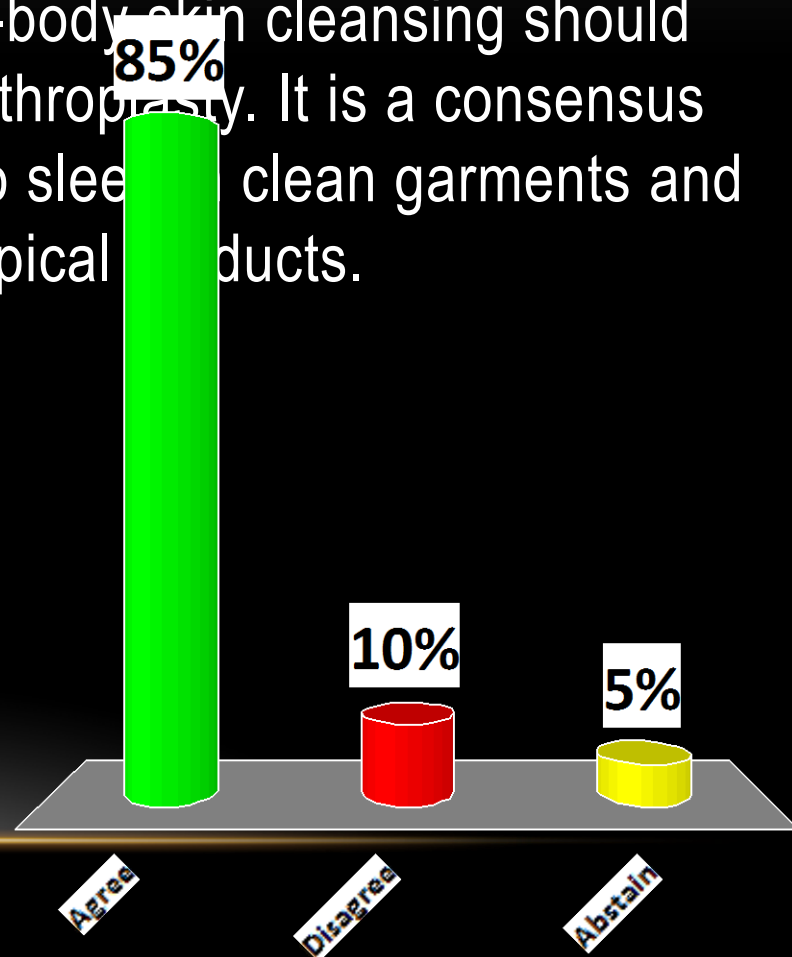


WG II

Question 1B: What type and when should preoperative skin cleansing with an antiseptic be implemented?

Consensus: We recommend that whole-body skin cleansing should start at least the night prior to elective arthroplasty. It is a consensus that after bathing, patients are advised to sleep in clean garments and bedding without the application of any topical products.

- A. Agree
- B. Disagree
- C. Abstain

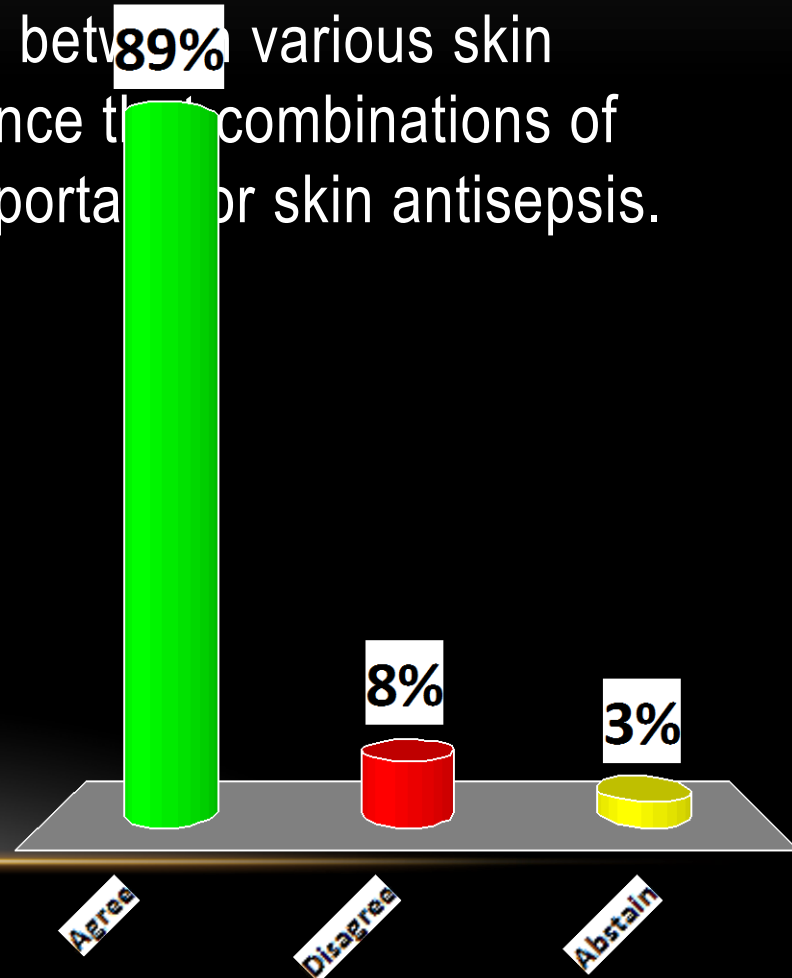


WG II

Question 2: Which agent, if any, is the optimal agent for surgical skin preparation?

Consensus: There is no clear difference between various skin preparation agents. There is some evidence that combinations of antiseptic agents with alcohol may be important for skin antiseptics.

- A. Agree
- B. Disagree
- C. Abstain

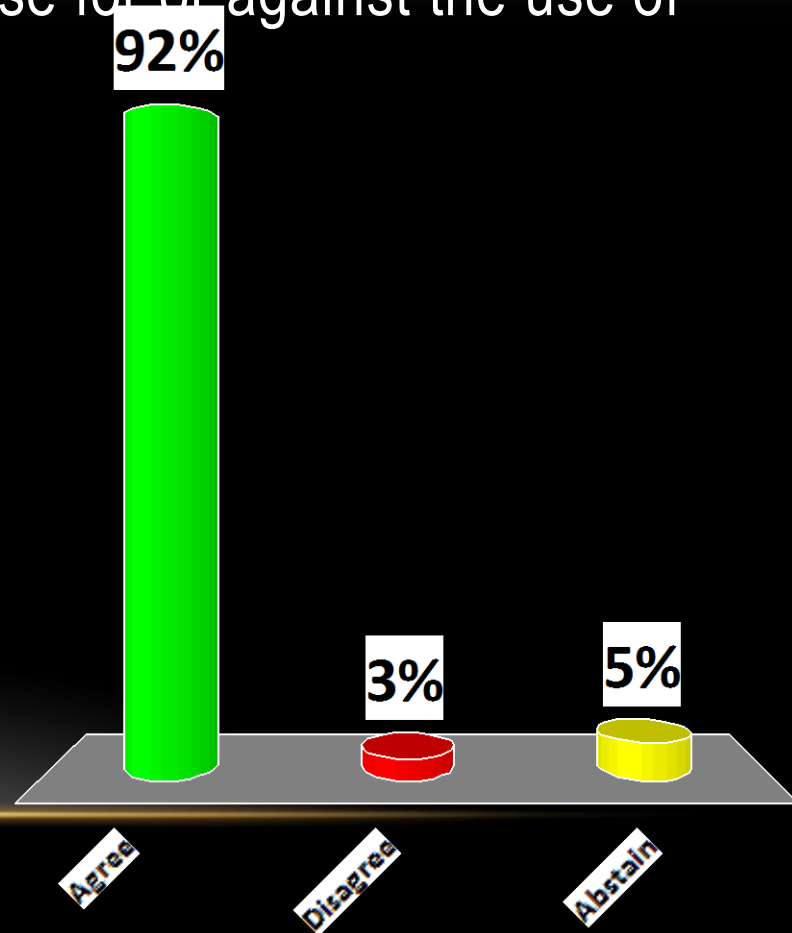


WG II

Question 3A: What is the proper method of hair removal?

Consensus: Clipping, as opposed to shaving, is the preferred method for hair removal. We cannot advise for or against the use of depilatory cream for removal of hair.

- A. Agree
- B. Disagree
- C. Abstain

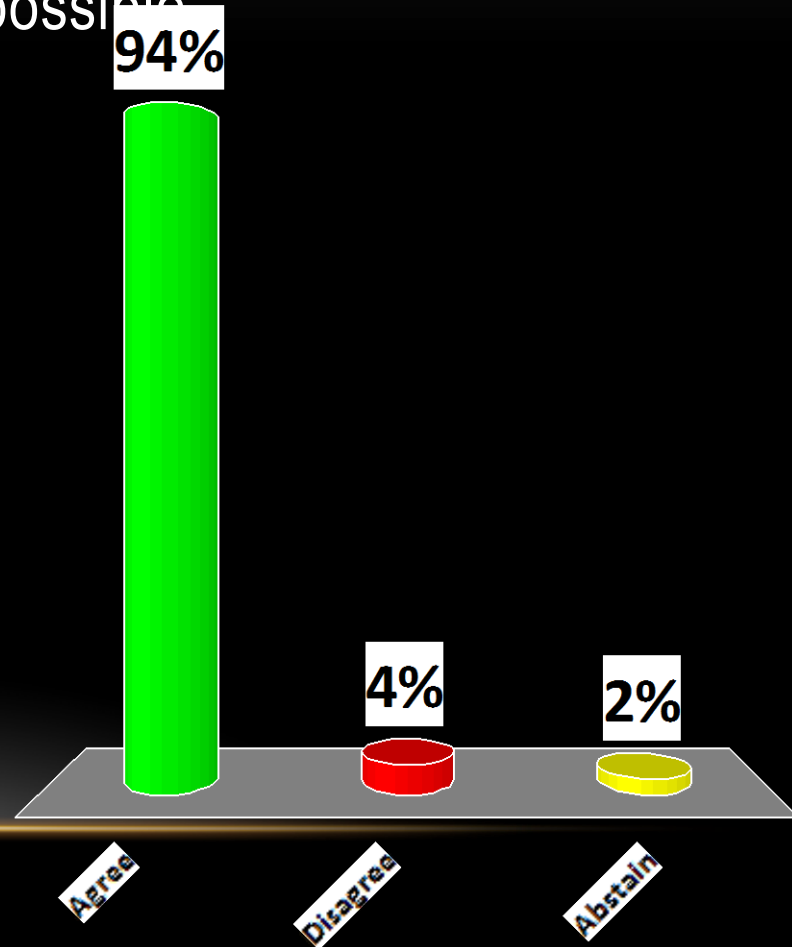


WG II

Question 3B: When should hair removal be performed?

Consensus: If necessary, hair removal should be performed as close to the time of the surgical procedure as possible.

- A. Agree
- B. Disagree
- C. Abstain

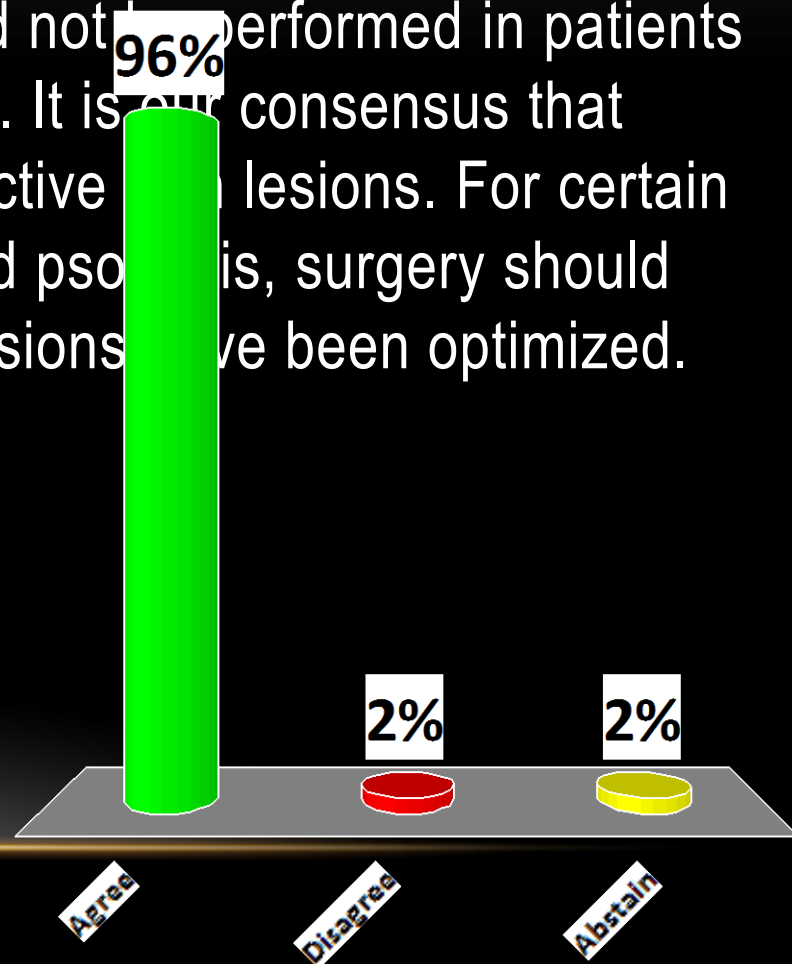


WG II

Question 4: What special considerations should be given to a patient with skin lesions?

Consensus: Elective arthroplasty should not be performed in patients with active ulceration of the surgical field. It is our consensus that incisions should not be placed through active skin lesions. For certain lesions such as those due to exzema and psoriasis, surgery should be delayed in these patients until their lesions have been optimized.

- A. Agree
- B. Disagree
- C. Abstain

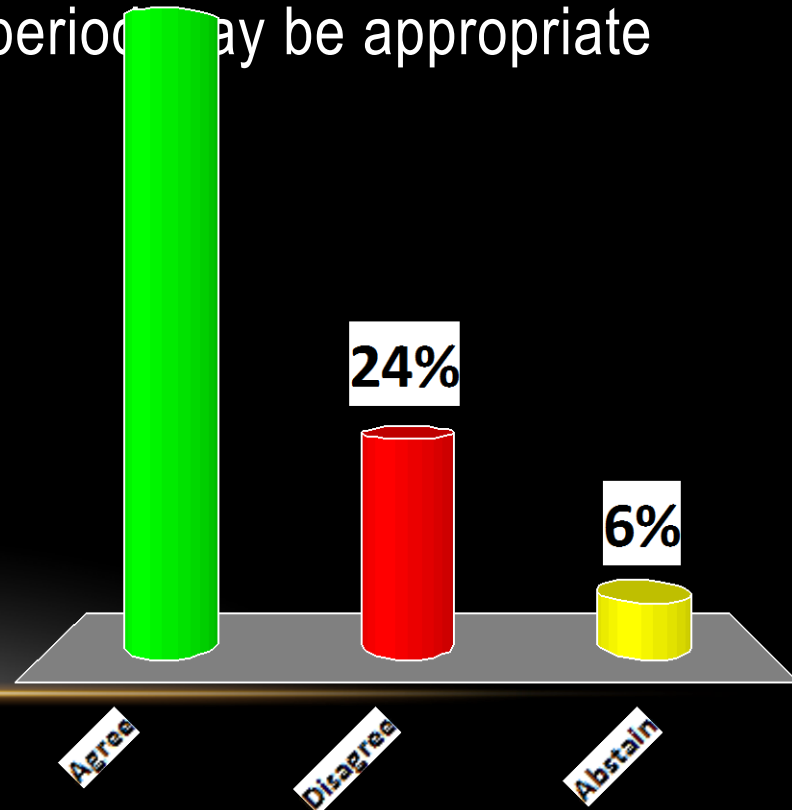


WG II

Question 5A: How should the surgeon and assistants wash their hands?

Consensus: The surgeon and operating room personnel should mechanically wash their hands with an antiseptic agent for a minimum of 2 minutes for the first case. A shorter period may be appropriate for subsequent cases.

- A. Agree
- B. Disagree
- C. Abstain

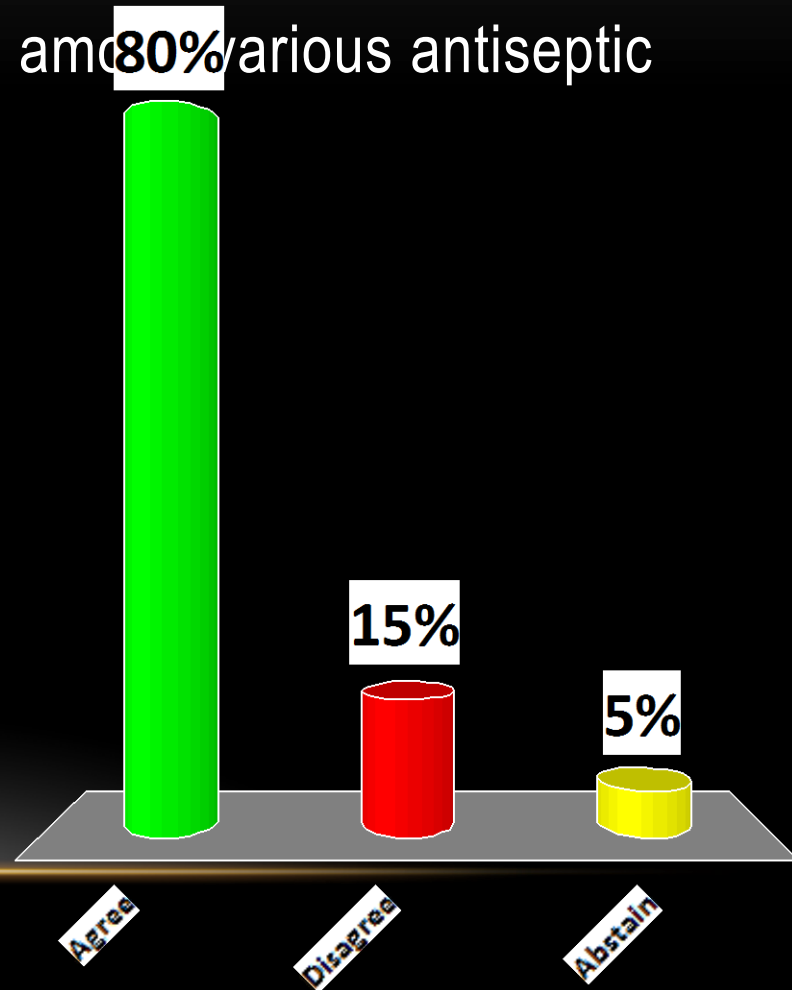


WG II

Question 5B: With what agent should the surgeon and assistants wash their hands?

Consensus: There is no clear difference among various antiseptic agents for hand washing.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 3: PERIOPERATIVE ANTIBIOTICS

Liaison: Eric Hansen MD

Leaders: Markus Vogt(International), Katherine Belden MD, Randy Silibovsky MD (US)

Delegates:

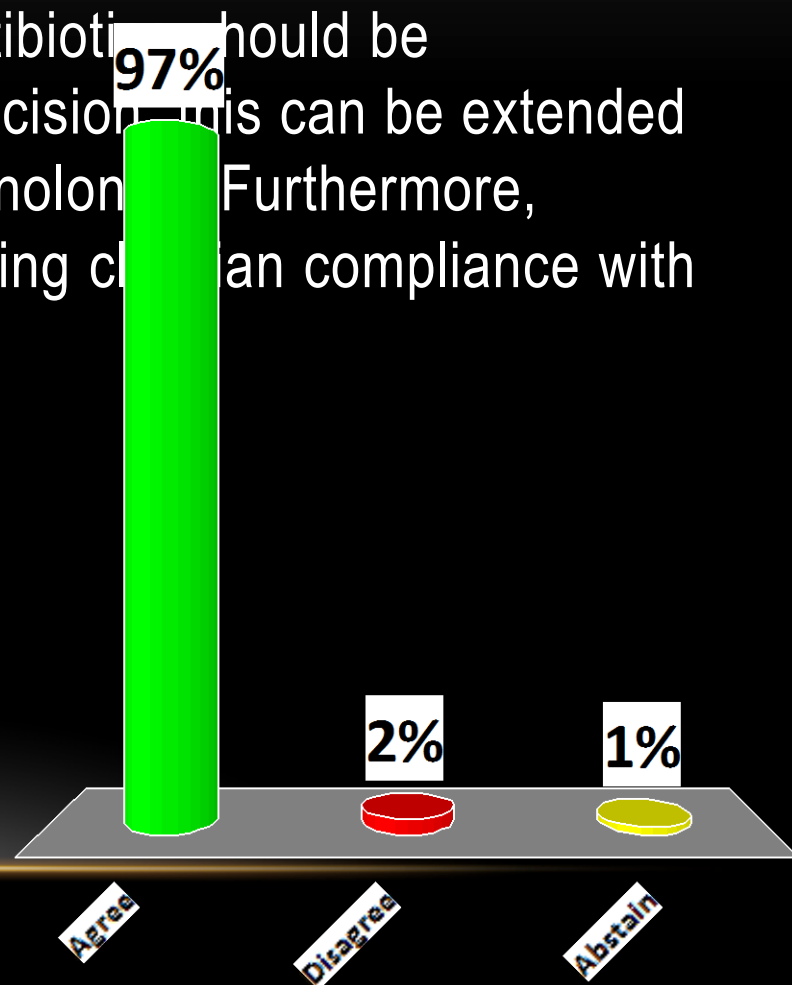
William Arnold MD, PhD, Stefano Bini MD, Fabio Catani MD, Jiying Chen PhD, Mohammad Ghazavi MD FRCSC, Paul Holtham MD, H Hosseinzadeh MD, Kang Il Kim MD, Klaus Kirketerp-Moller MD, Lars Lidgren MD PhD, Jian Hao Lin MD, Jess H Lonner MD, Christopher Moore MD, Panayiotis Papagelopoulos MD, Lazaros Poultsides MD MSc PhD, Khaled Saleh MD MSC FRCSC MHCM, Julia V Salmon MD, Edward Schwarz MD, Jose Stuyck MD, Annette W Dahl MD, Koji Yamada MD

WG III

Question 1: What is the optimal timing of the preoperative dose of antibiotics?

Consensus: The preoperative dose of antibiotics should be administered within one hour of surgical incision. This can be extended to two hours for vancomycin and fluoroquinolones. Furthermore, surveillance measures are critical in ensuring clinician compliance with this objective.

- A. Agree
- B. Disagree
- C. Abstain

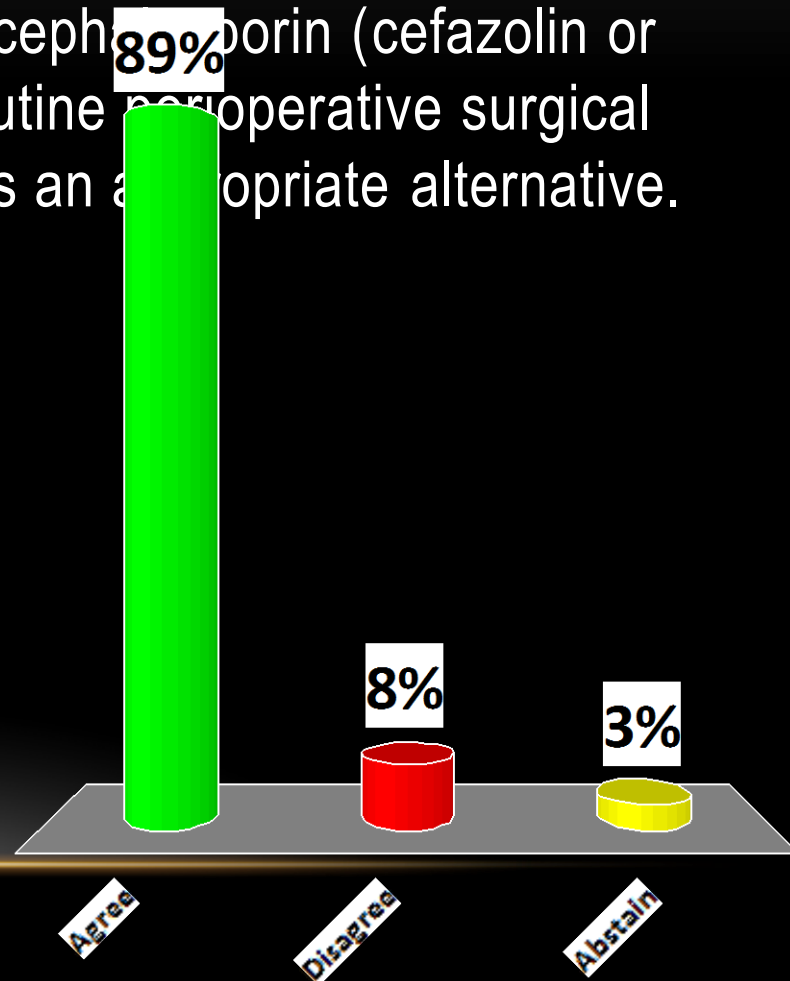


WG III

Question 2: Is there an optimal antibiotic that should be administered for routine perioperative surgical prophylaxis?

Consensus: A first or second-generation cephalosporin (cefazolin or cefuroxime) should be administered for routine perioperative surgical prophylaxis. Isoxazolyl penicillin is used as an appropriate alternative.

- A. Agree
- B. Disagree
- C. Abstain

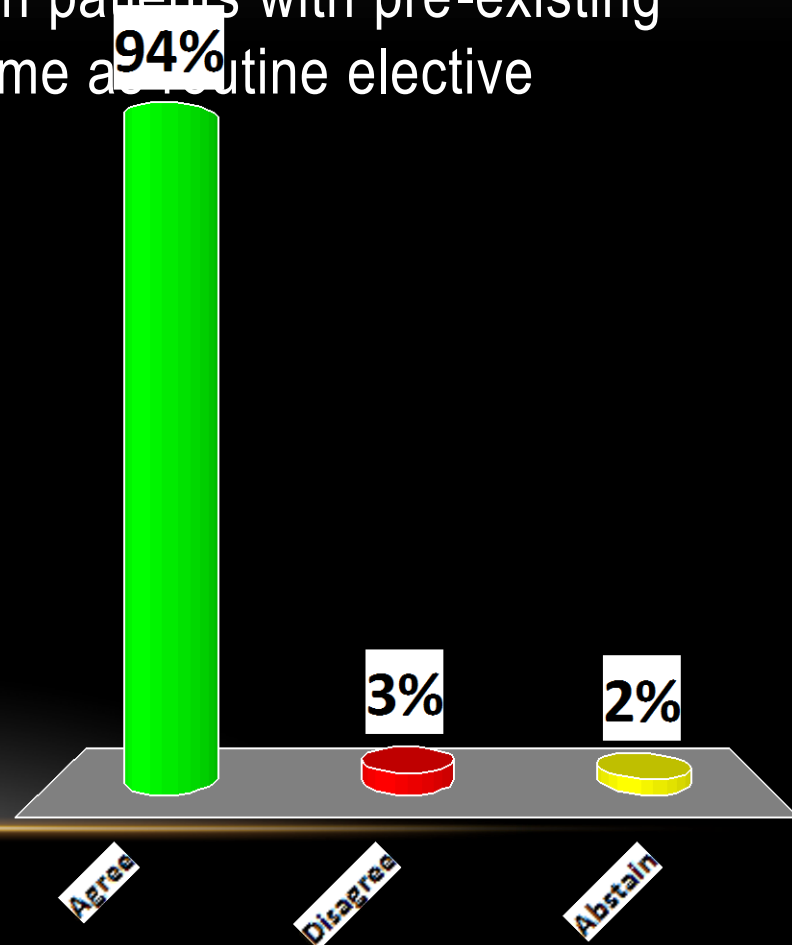


WG III

Question 3: What is the choice of antibiotic in patients who have pre-existing prostheses such as heart valves?

Consensus: The choice of antibiotics for in patients with pre-existing prostheses such as heart valves, is the same as routine elective arthroplasty.

- A. Agree
- B. Disagree
- C. Abstain

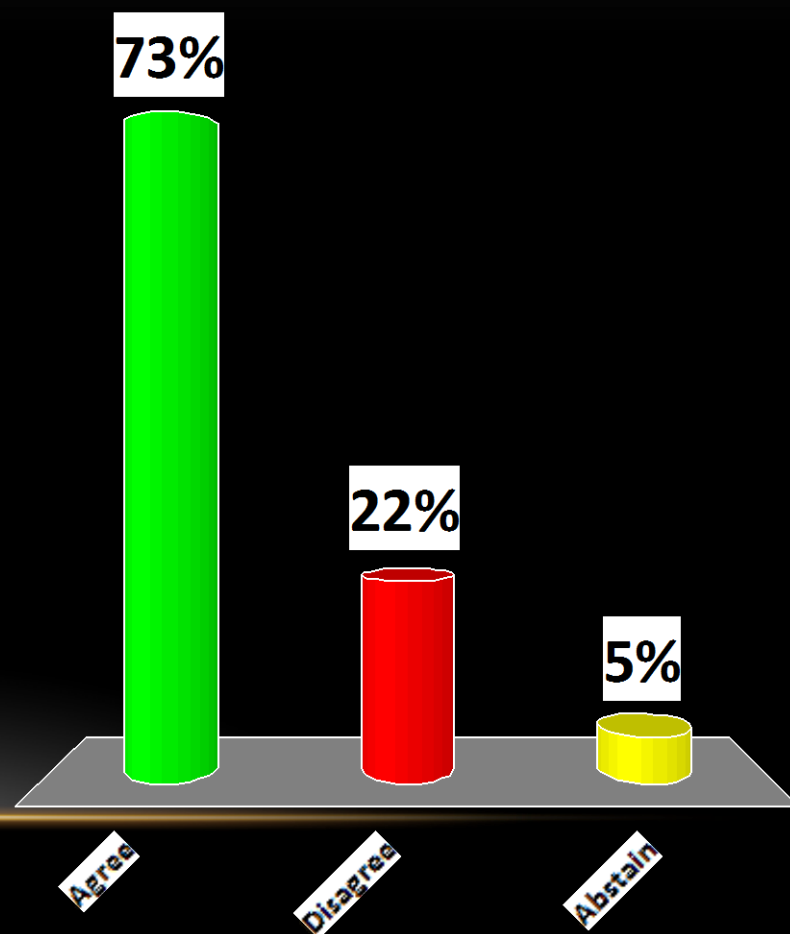


WG III

Question 4: What alternatives are available for routine prophylaxis?

Consensus: Currently teicoplanin and vancomycin are reasonable alternative for routine prophylaxis.

- A. Agree
- B. Disagree
- C. Abstain

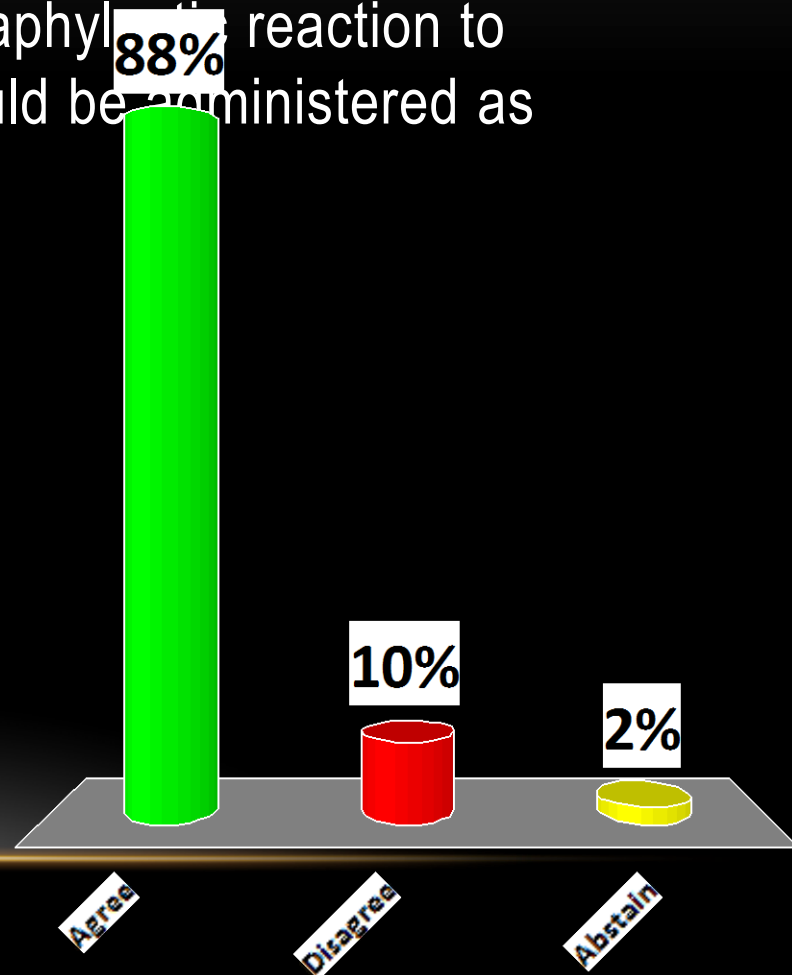


WG III

Question 5A: What antibiotic should be administered in a patient with a known anaphylactic penicillin allergy?

Consensus: In a patient with a known anaphylactic reaction to penicillin, vancomycin or clindamycin should be administered as prophylaxis.

- A. Agree
- B. Disagree
- C. Abstain

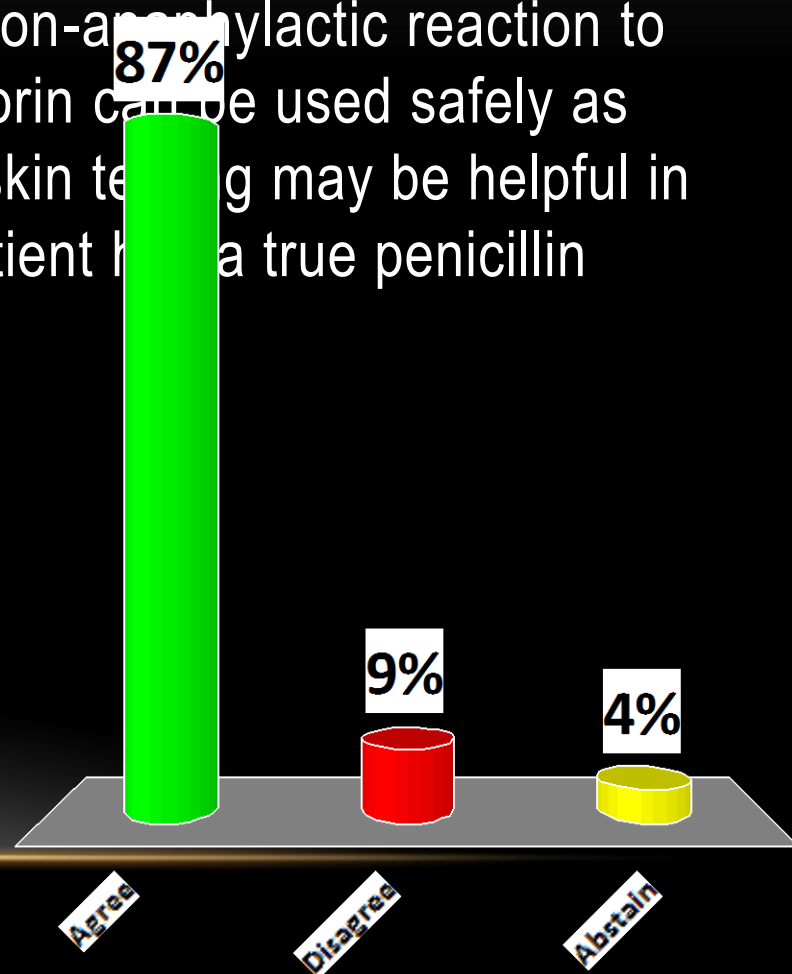


WG III

Question 5B: What antibiotic should be administered in a patient with a known non-anaphylactic penicillin allergy?

Consensus: In a patient with a reported non-anaphylactic reaction to penicillin, a second-generation cephalosporin can be used safely as there is limited cross-reactivity. Penicillin skin testing may be helpful in certain situations to clarify whether the patient has a true penicillin allergy.

- A. Agree
- B. Disagree
- C. Abstain



WG III

Question 6: What are the indications for administration of vancomycin?

Consensus: Vancomycin should be administered to patients who are MRSA carriers or have penicillin anaphylactic allergy. **93%**

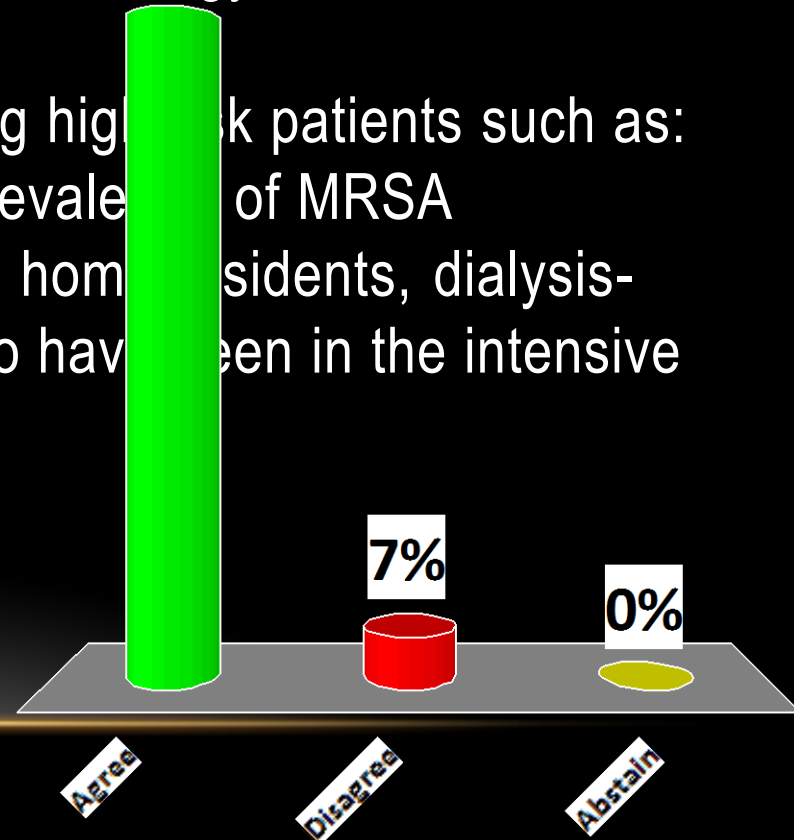
Consideration should be given to screening high-risk patients such as:

- Patients in regions with a high prevalence of MRSA
- Institutionalized patients (nursing home residents, dialysis-dependent patients, and those who have been in the intensive care unit)
- Healthcare workers

A. Agree

B. Disagree

C. Abstain

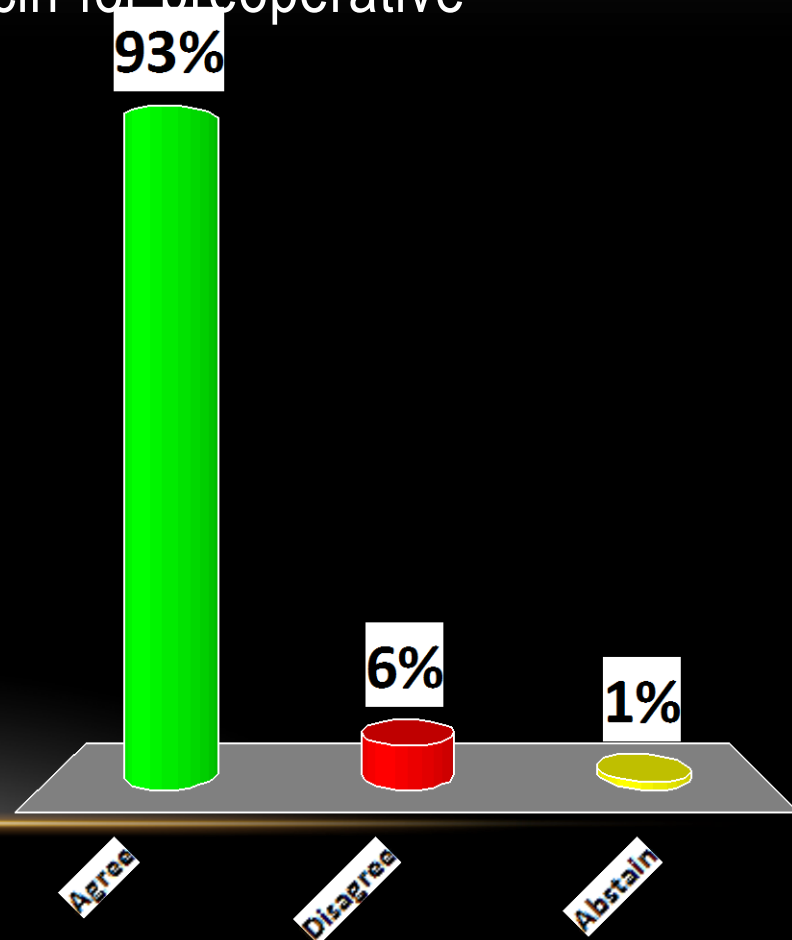


WG III

Question 7: Is there evidence to support the routine use of vancomycin for preoperative prophylaxis?

Consensus: No. Routine use of vancomycin for preoperative prophylaxis is not recommended.

- A. Agree
- B. Disagree
- C. Abstain

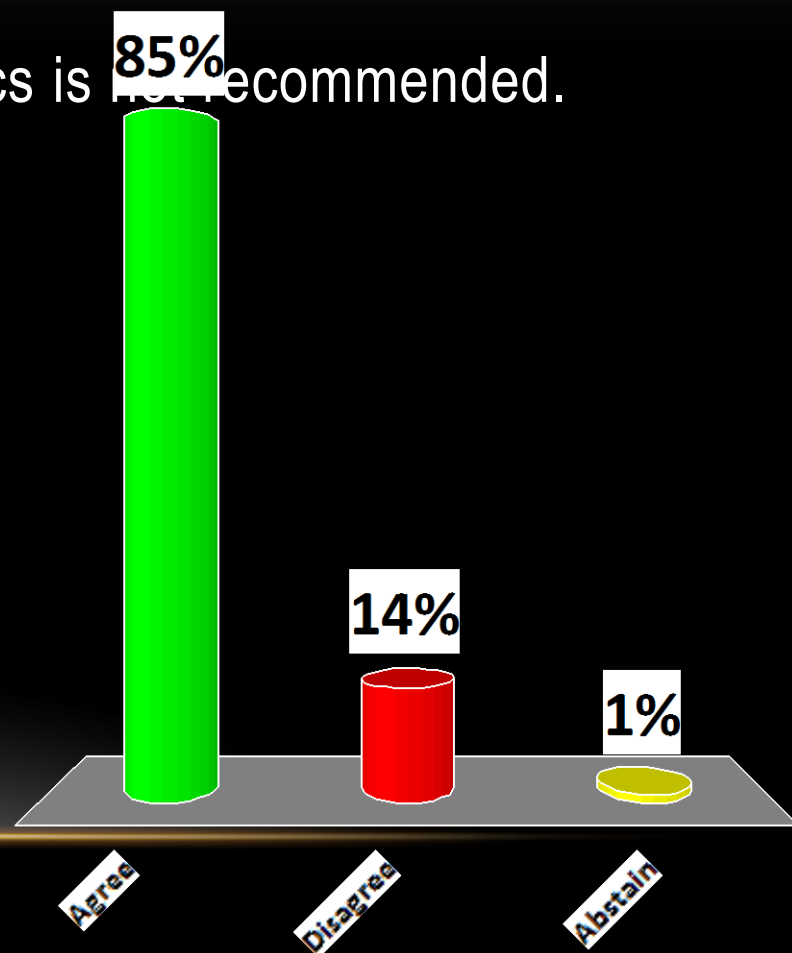


WG III

Question 8: What are the indications for dual antibiotics (cephalosporins and aminoglycosides or cephalosporins and vancomycin)?

Consensus: Routine use of dual antibiotics is **not** recommended.

- A. Agree
- B. Disagree
- C. Abstain

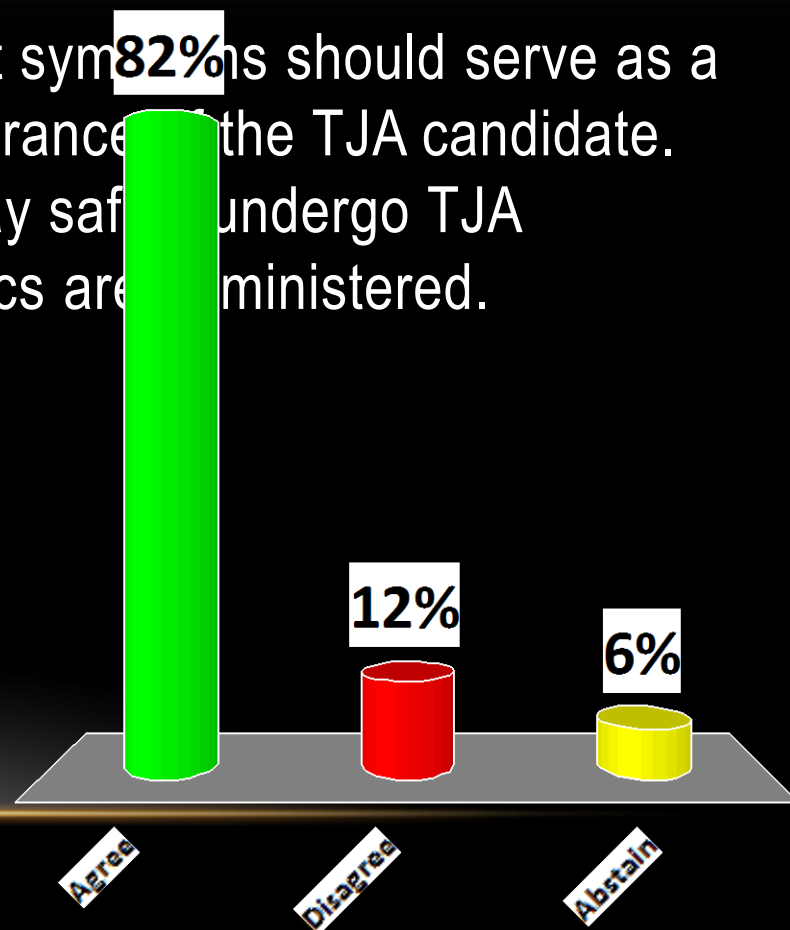


WG III

Question 9: What should be the antibiotic of choice for patients with abnormal urinary screening and/or an indwelling urinary catheter?

Consensus: The presence of urinary tract symptoms should serve as a preliminary screening tool for surgical clearance of the TJA candidate. Asymptomatic patients with bacteriuria may safely undergo TJA provided that routine prophylactic antibiotics are administered.

- A. Agree
- B. Disagree
- C. Abstain

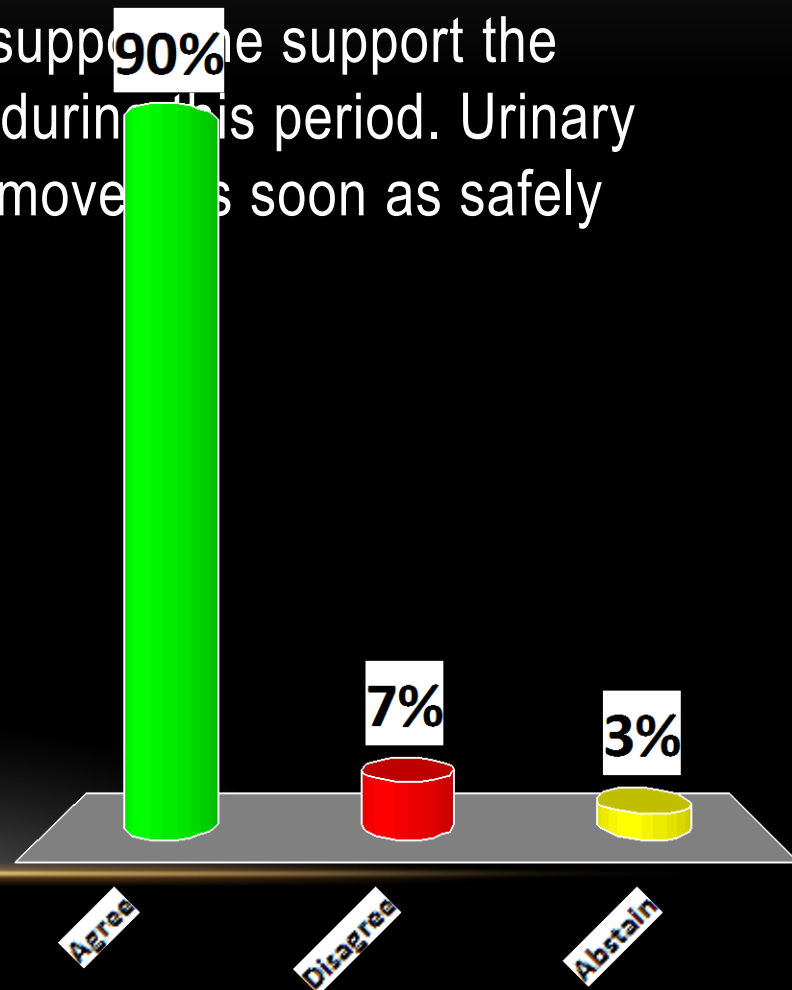


WG III

Question 10: Should postoperative antibiotics be continued while a urinary catheter or surgical drain remains in place?

Consensus: No. There is no evidence to support the continued use of postoperative antibiotics during this period. Urinary catheters and surgical drains should be removed as soon as safely possible.

- A. Agree
- B. Disagree
- C. Abstain

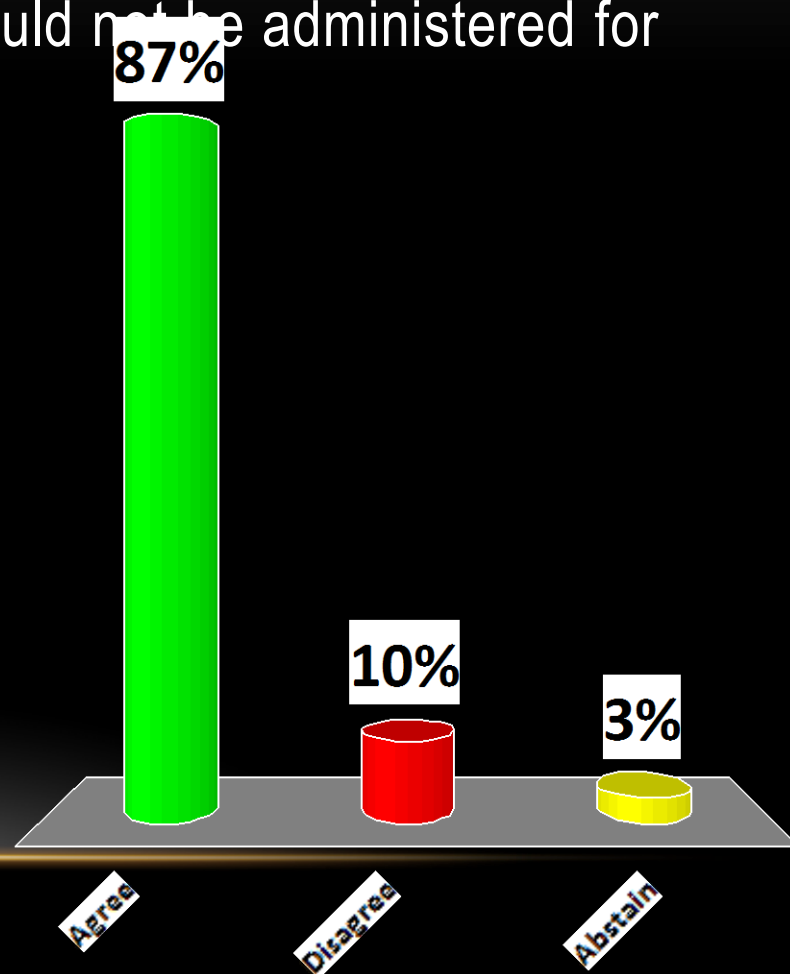


WG III

Question 11: What is the evidence for the optimal duration of postoperative antibiotics in decreasing SSI or PJI?

Consensus: Postoperative antibiotics should not be administered for greater than 24 hours after surgery.

- A. Agree
- B. Disagree
- C. Abstain

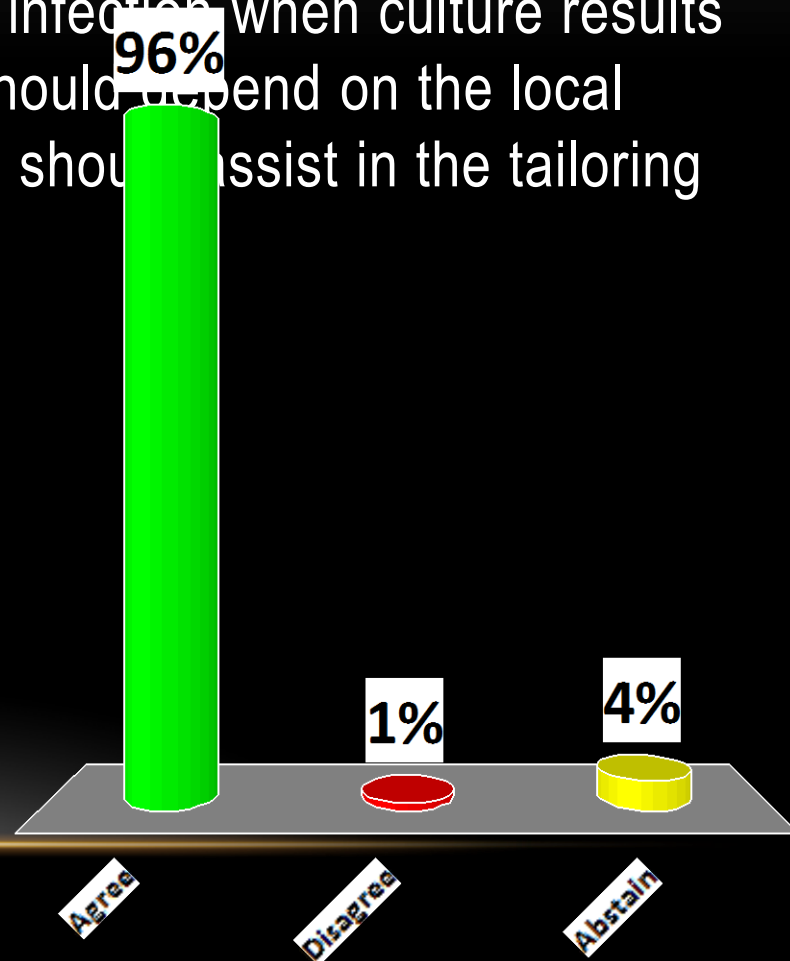


WG III

Question 12: Until culture results are finalized, what antibiotic should be administered to a patient with a presumed infection?

Consensus: In a patient with a presumed infection when culture results are pending, empiric antibiotic coverage should depend on the local microbiological epidemiology. Culture data should assist in the tailoring of antibiotic regimens.

- A. Agree
- B. Disagree
- C. Abstain

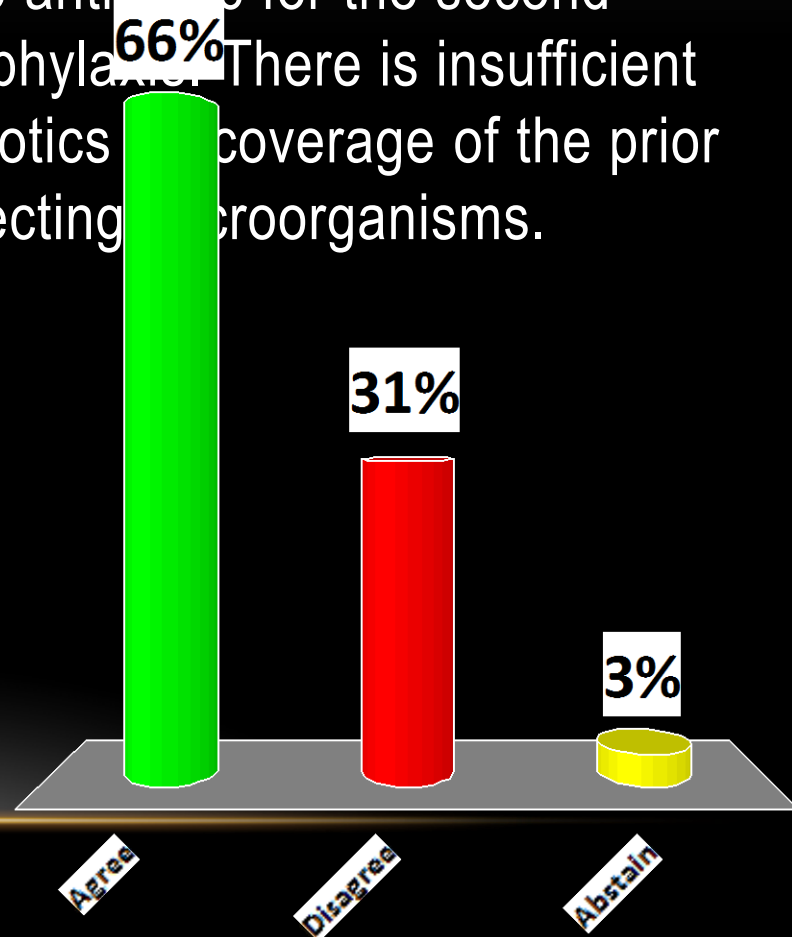


WG III

Question 13: What is the appropriate preoperative antibiotic for a second-stage procedure?

Consensus: The appropriate preoperative antibiotic for the second stage should include routine antibiotic prophylaxis. There is insufficient data to support the use of additional antibiotics for coverage of the prior organism as well as the most common infecting microorganisms.

- A. Agree
- B. Disagree
- C. Abstain

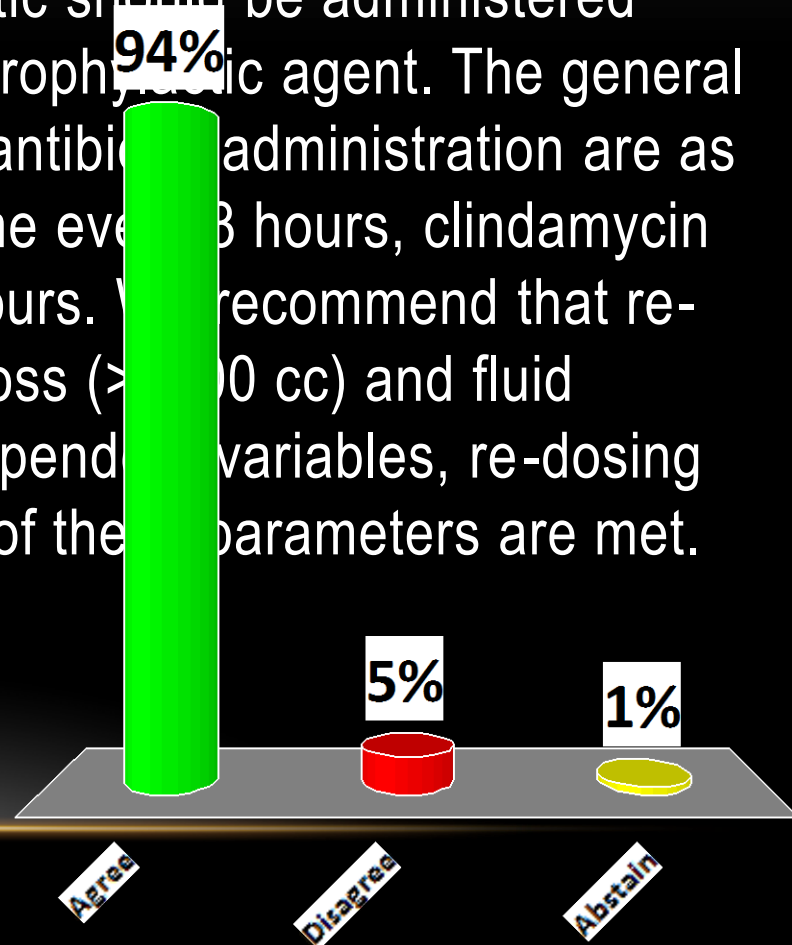


WG III

Question 14: For surgeries of longer duration, when should an additional dose of antibiotic be administered intraoperatively?

Consensus: An additional dose of antibiotic should be administered intraoperatively after two half-lives of the prophylactic agent. The general guidelines for frequency of intraoperative antibiotic administration are as follows: cefazolin every 3 hours, cefuroxime every 3 hours, clindamycin every 3 hours, and vancomycin every 6 hours. We recommend that re-dosing of in cases of large blood volume loss (>1000 cc) and fluid resuscitation (>2000 cc). As these are independent variables, re-dosing should be considered as soon as the first of the parameters are met.

- A. Agree
- B. Disagree
- C. Abstain

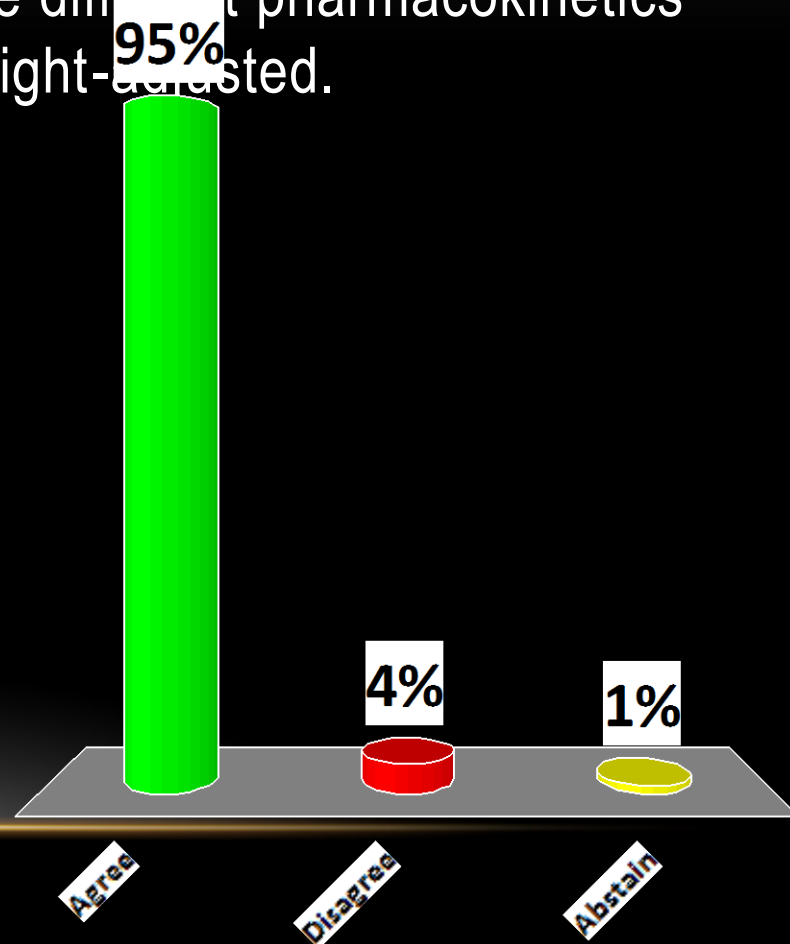


WG III

Question 15: Should preoperative antibiotic doses be weight-adjusted?

Consensus: Preoperative antibiotics have different pharmacokinetics based on patient weight and should be weight-adjusted.

- A. Agree
- B. Disagree
- C. Abstain

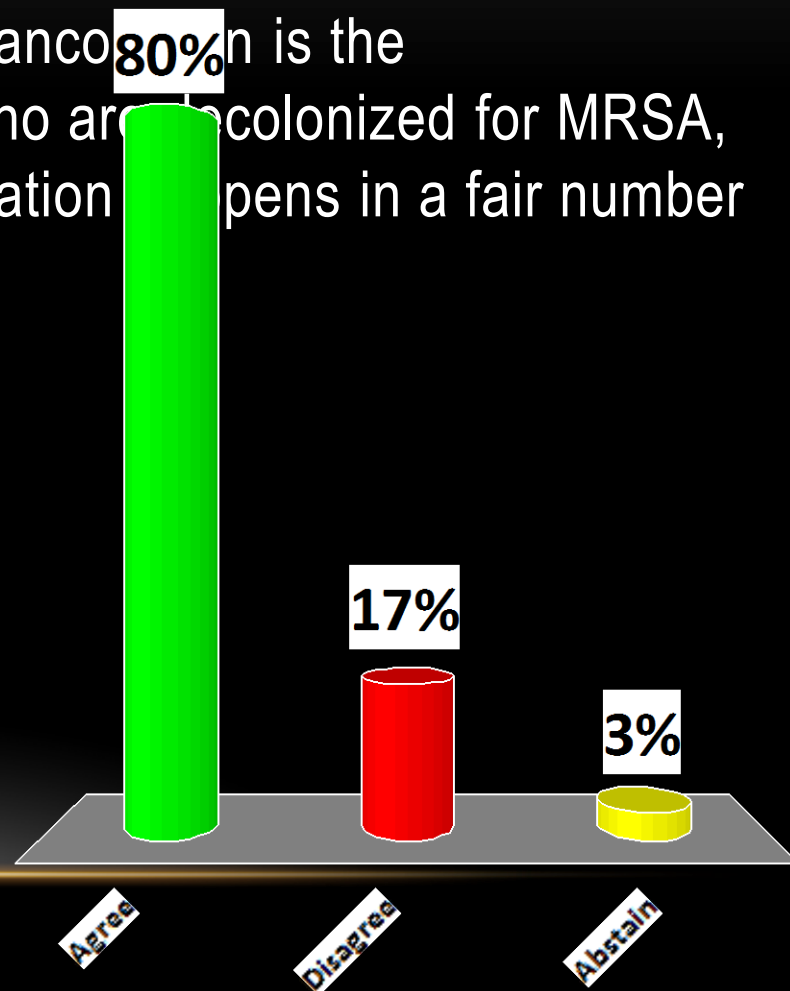


WG III

Question 16: What type of prophylaxis is recommended for proven MRSA carriers? Does decontamination alter them?

Consensus: For proven MRSA carriers, vancomycin is the recommended prophylaxis. For patients who are decontaminated for MRSA, we recommend re-screening as re-colonization happens in a fair number of patients.

- A. Agree
- B. Disagree
- C. Abstain

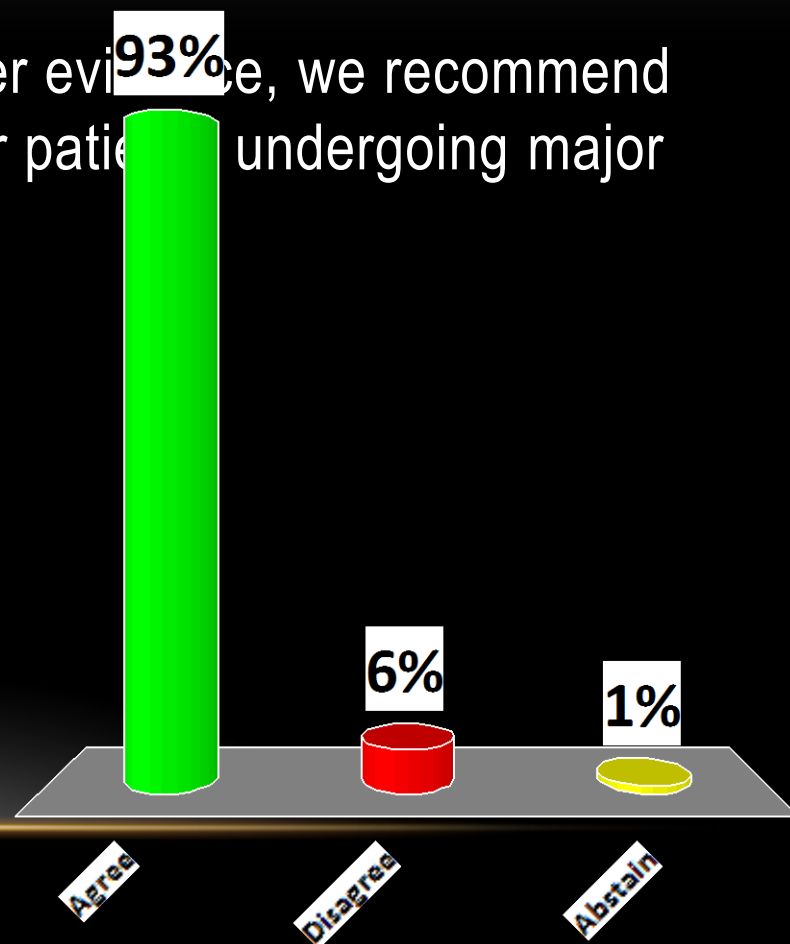


WG III

Question 17: What is the recommended prophylaxis, in patients undergoing major orthopaedic reconstructions for either tumor or non-neoplastic conditions using megaprosthesis?

Consensus: Until the emergence of further evidence, we recommend the use of routine antibiotic prophylaxis for patients undergoing major reconstruction.

- A. Agree
- B. Disagree
- C. Abstain

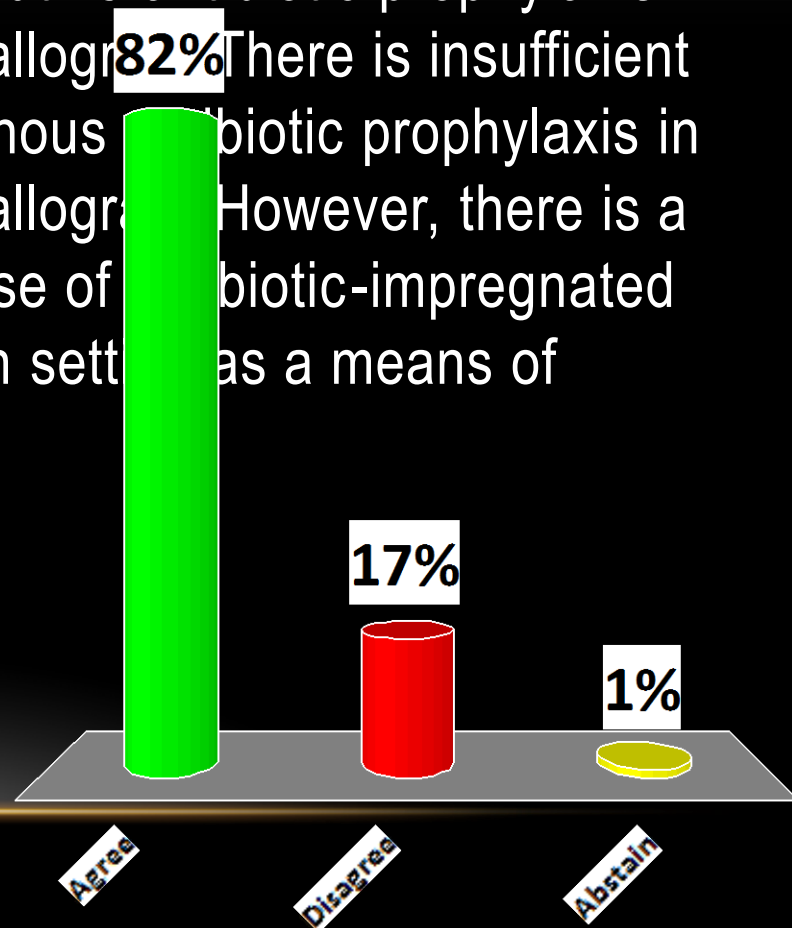


WG III

Question 18: Should antibiotic therapy be different in patients who have reconstruction by bulk allograft?

Consensus: We recommend the use of routine antibiotic prophylaxis in patients who have reconstruction by bulk allograft. **82%** There is insufficient evidence regarding the duration of intravenous antibiotic prophylaxis in patients who have reconstruction by bulk allograft. However, there is a growing body of literature to support the use of antibiotic-impregnated allograft and calcium sulfate in the revision setting as a means of decreasing infection rates.

- A. Agree
- B. Disagree
- C. Abstain

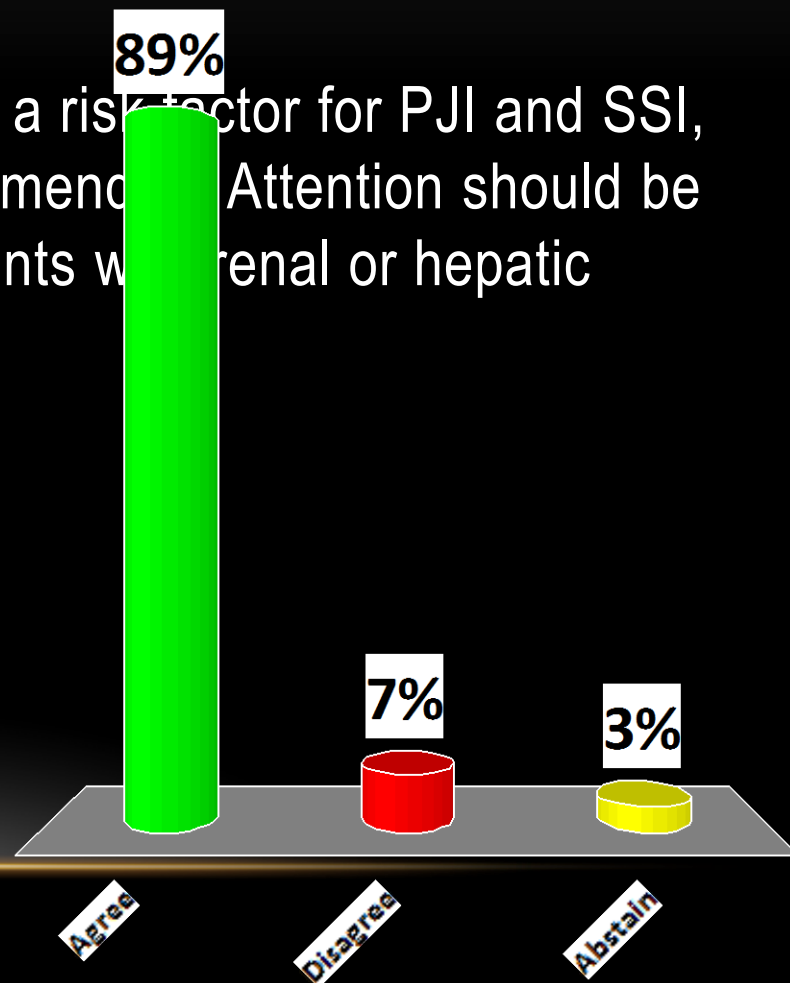


WG III

Question 19: Do patients with uncontrolled diabetes (HbA1C>7%), immunosuppression, or autoimmune disease require a different prophylactic approach?

Consensus: While immunosuppression is a risk factor for PJI and SSI, no different antibiotic prophylaxis is recommended. Attention should be directed towards dosing frequency in patients with renal or hepatic disease.

- A. Agree
- B. Disagree
- C. Abstain

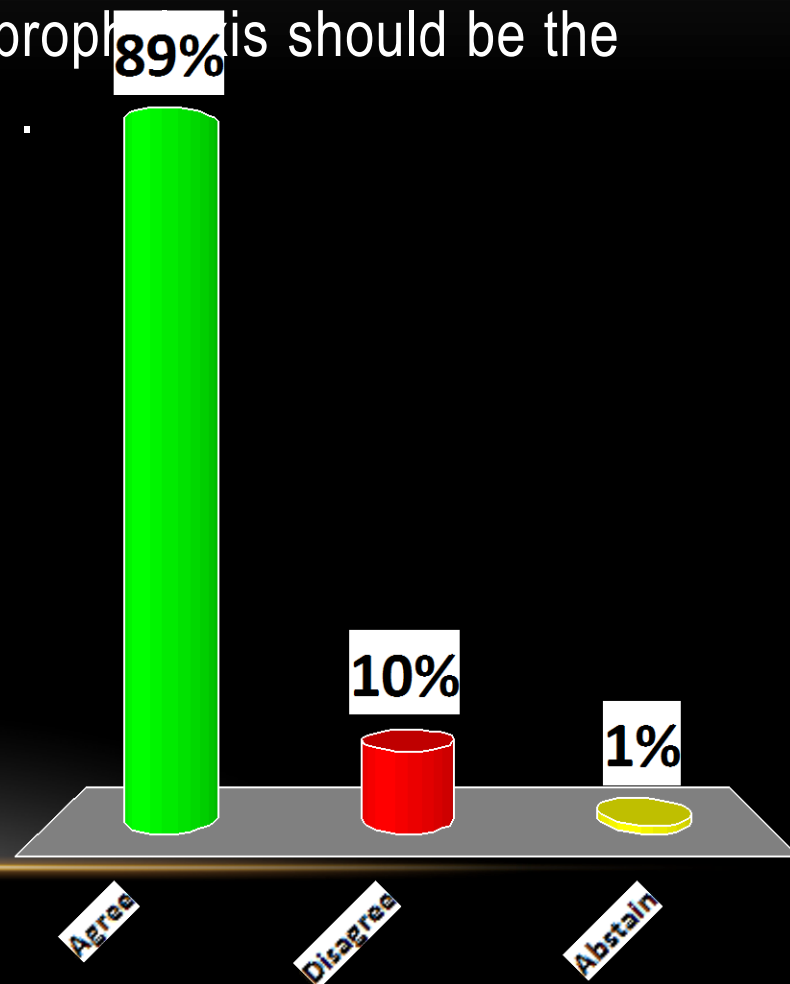


WG III

Question 20A: Should preoperative antibiotics be different for primary and revision TJA?

Consensus: No. Perioperative antibiotic prophylaxis should be the same for primary and revision arthroplasty .

- A. Agree
- B. Disagree
- C. Abstain

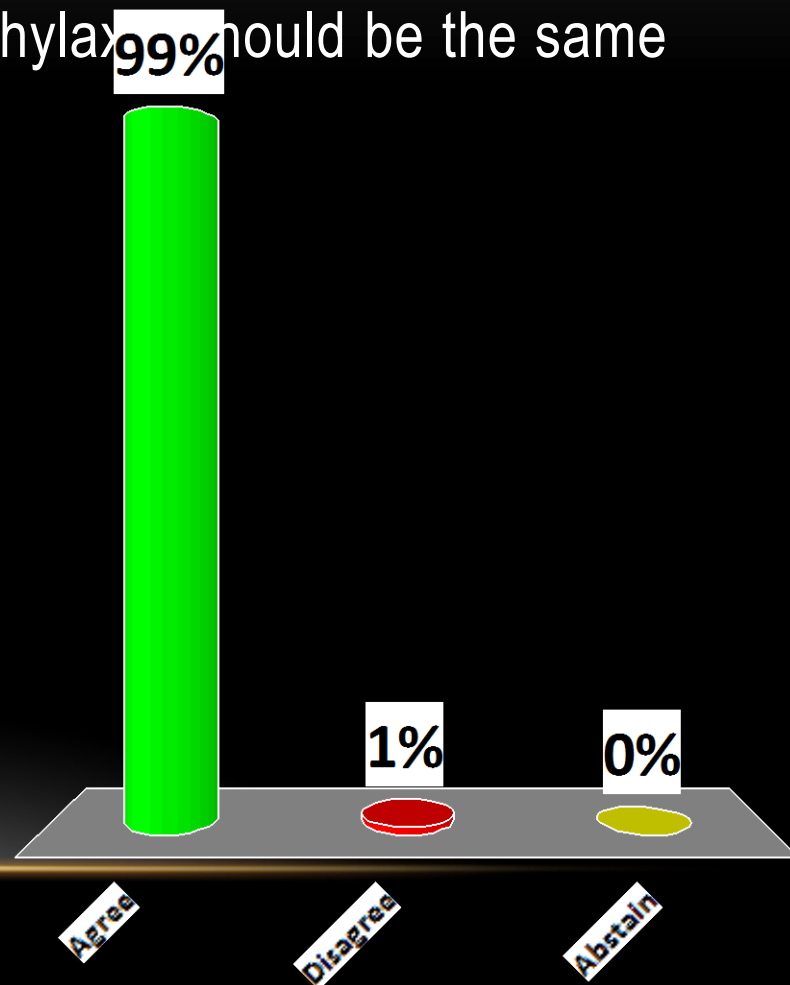


WG III

Question 20B: Should preoperative antibiotics be different for hips and knees?

Consensus: Perioperative antibiotic prophylaxis should be the same for hips and knees .

- A. Agree
- B. Disagree
- C. Abstain

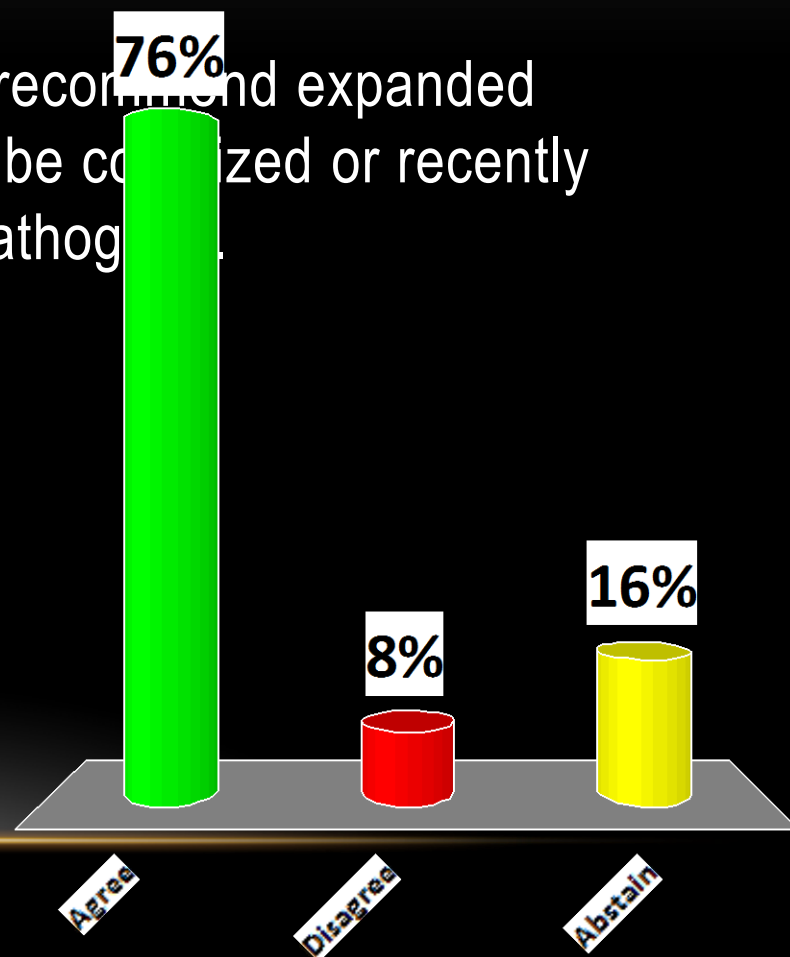


WG III

Question 21: What is the best antibiotic prophylaxis to choose in patients with colonization by carbapenem resistant enterobacteriaceae or MDR-Acinetobacter spp?

Consensus: There is insufficient data to recommend expanded antibiotic prophylaxis in patients known to be colonized or recently infected with multi-drug resistant (MDR) pathogens.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 4: OPERATIVE ENVIRONMENT

Liaison Pouya Alijanipour MD, Joseph Karam MD

Leaders Adolfo Llinas MD, Kelly Vince MD, (International), Charalampos Zalavras MD (US)

Delegates:

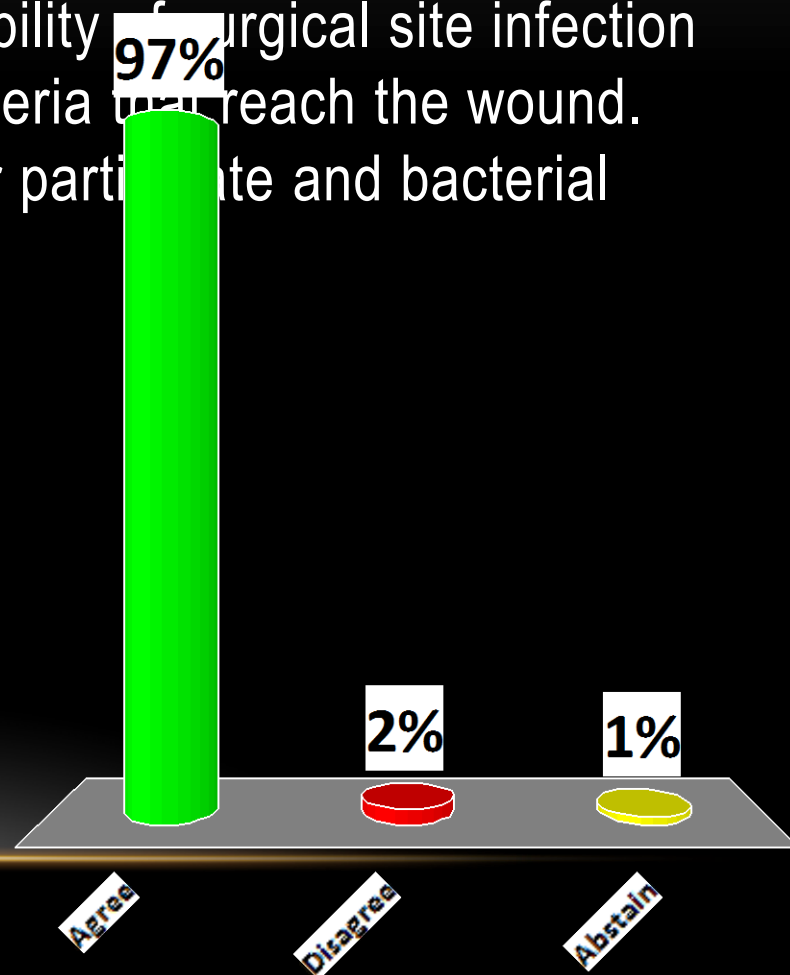
Matthew Austin MD, Grant Garrigues MD, Snir Heller MD, James Huddleston MD, Brain Klatt MD, Viktor Krebs MD, Christoph Lohmann MD, Henrick Malchau MD, Robert Molloy MD, Ali Oliashirazi MD, Mitchell Schwaber MD, Mohammad Hossain Shahcheraghi MD, Eoin Sheehan MD, Eric Smith MD, Greg Stocks MD, Shrinand Vaidya MD, Jonathan Waters MD

WG IV

Question 1: Do numbers of bacteria arriving in the surgical wound correlate directly with probability of SSI?

Consensus: We recognize that the probability of surgical site infection correlates directly with the quantity of bacteria that reach the wound. Accordingly we support strategies to lower particle rate and bacterial counts in surgical wounds.

- A. Agree
- B. Disagree
- C. Abstain

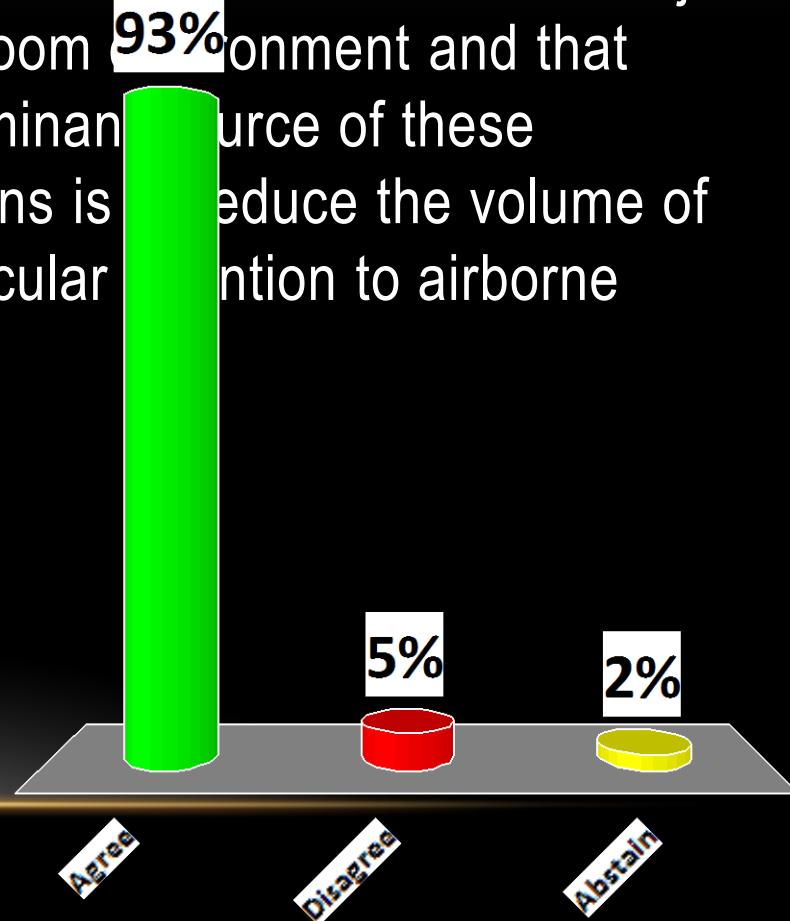


WG IV

Question 2: Do numbers of bacteria in the OR environment correlate directly with probability of SSI?

Consensus: We recognize that airborne particulate bacteria are a major source of contamination in the operating room environment and that bacteria shed by personnel are the predominant source of these particles. The focus of our recommendations is to reduce the volume of bacteria in the operating theatre with particular attention to airborne particles.

- A. Agree
- B. Disagree
- C. Abstain

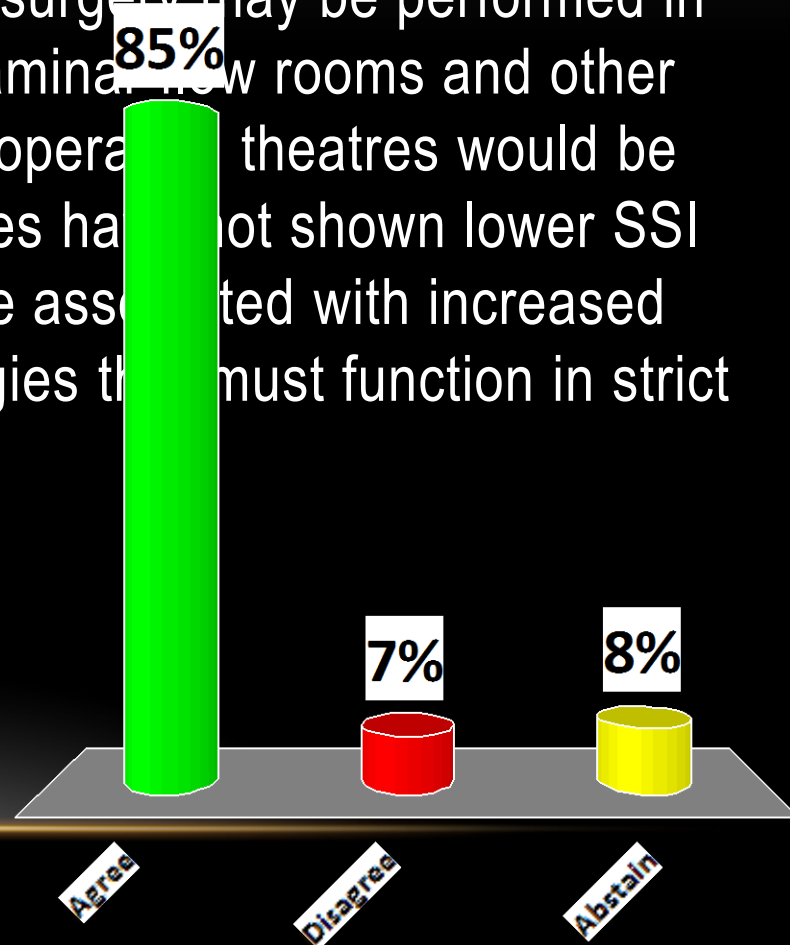


WG IV

Question 3: Should the operating room (OR) in which an elective arthroplasty is performed be fitted with laminar air flow (LAF)?

Consensus: We believe that arthroplasty surgery may be performed in operating theaters without laminar flow. Laminar flow rooms and other strategies that may reduce particulates in operating theatres would be expected to reduce particulate load. Studies have not shown lower SSI in laminar flow rooms and some cases, are associated with increased rates of SSI. These are complex technologies that must function in strict adherence to maintenance protocols.

- A. Agree
- B. Disagree
- C. Abstain

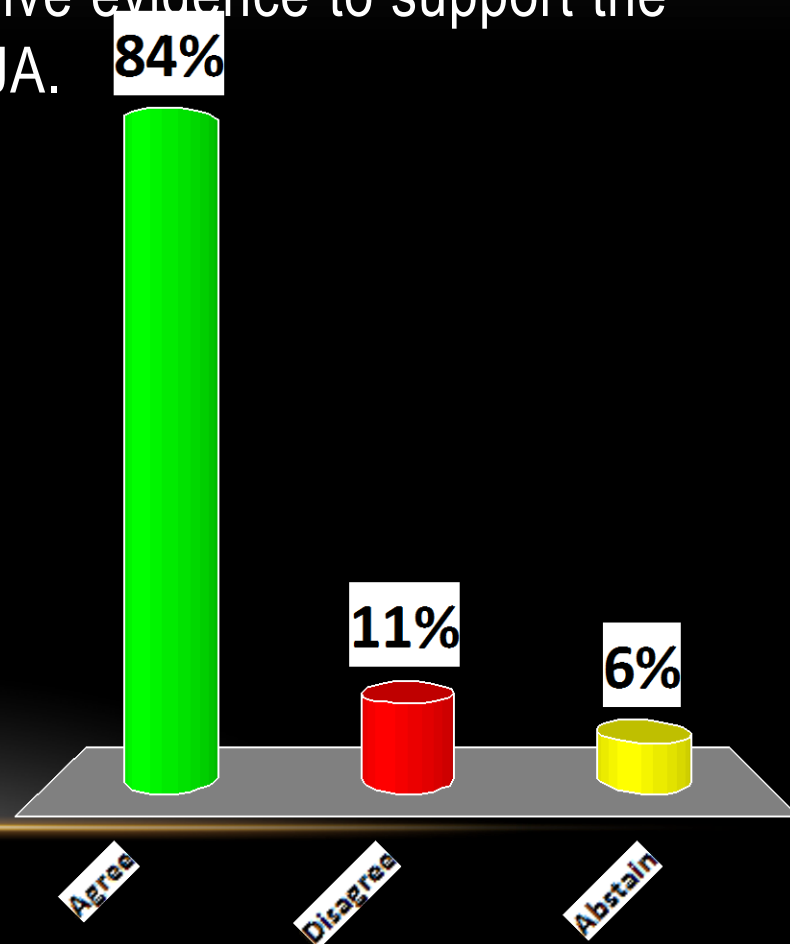


WG IV

Question 4: Is there enough evidence to enforce the universal use of space suits during total joint arthroplasty (TJA)?

Consensus: There is currently no conclusive evidence to support the routine use of space suits in performing TJA.

- A. Agree
- B. Disagree
- C. Abstain

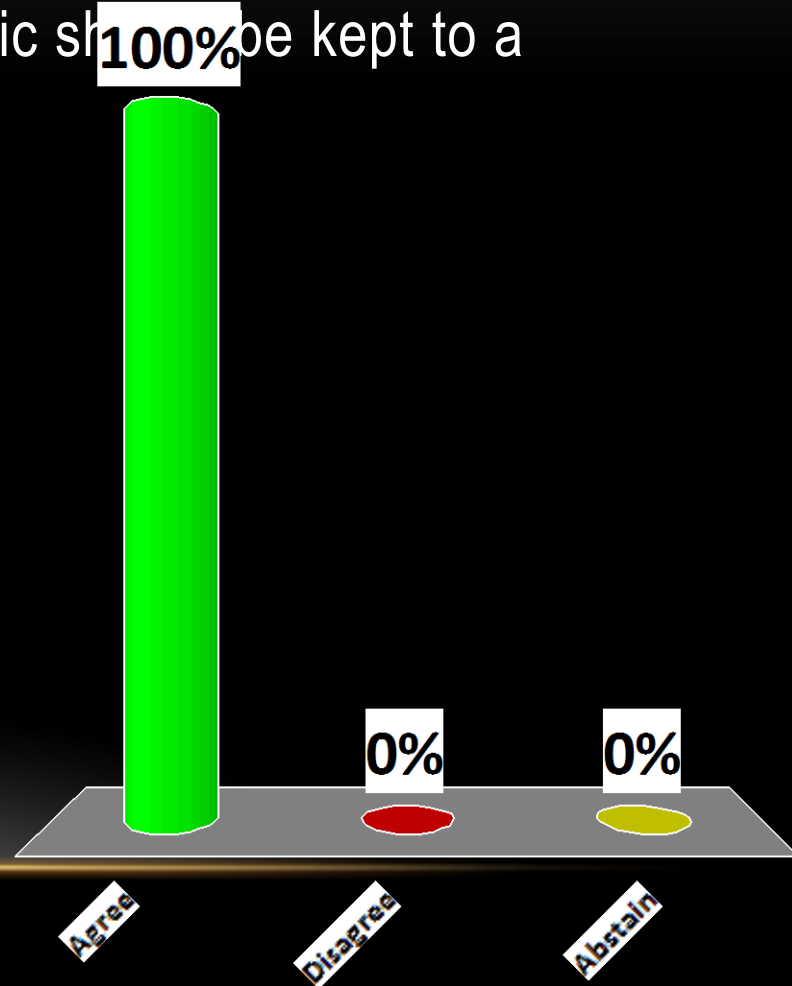


WG IV

Question 5: What strategies should be implemented regarding OR traffic?

Consensus: We recommend that OR traffic should be kept to a minimum.

- A. Agree
- B. Disagree
- C. Abstain

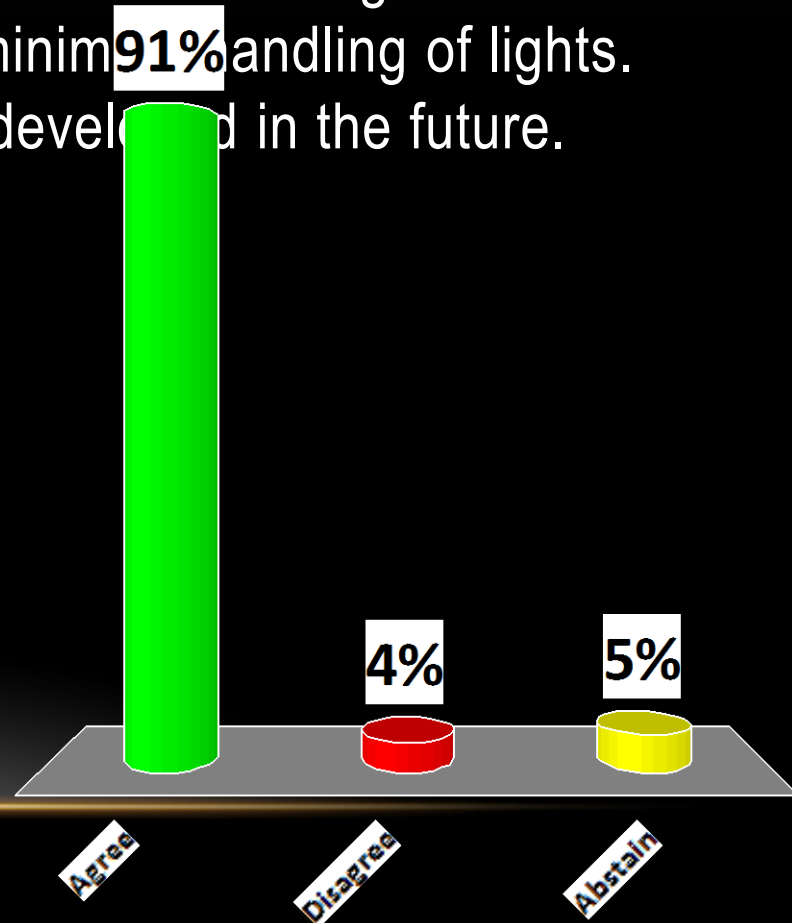


WG IV

Question 6: Should operating lights be controlled with a foot pedal as opposed to reaching above eye level?

Consensus: We recommend a general awareness that light handles can be a source of contamination and to minimize handling of lights. Other strategies for light control might be developed in the future.

- A. Agree
- B. Disagree
- C. Abstain

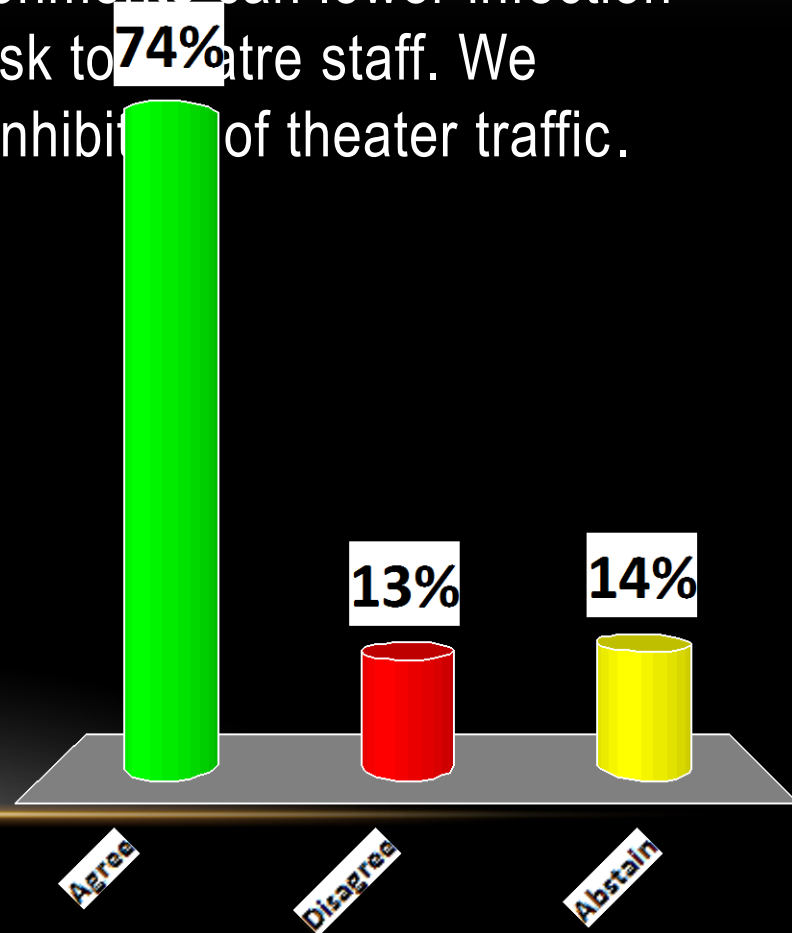


WG IV

Question 7: Is there a role for ultraviolet (UV) light use in prevention of infection after TJA?

Consensus: We agree that UV light environments can lower infection rates, but recognize that this can pose a risk to theatre staff. We recognize that the benefit of UV might be inhibited by theater traffic.

- A. Agree
- B. Disagree
- C. Abstain

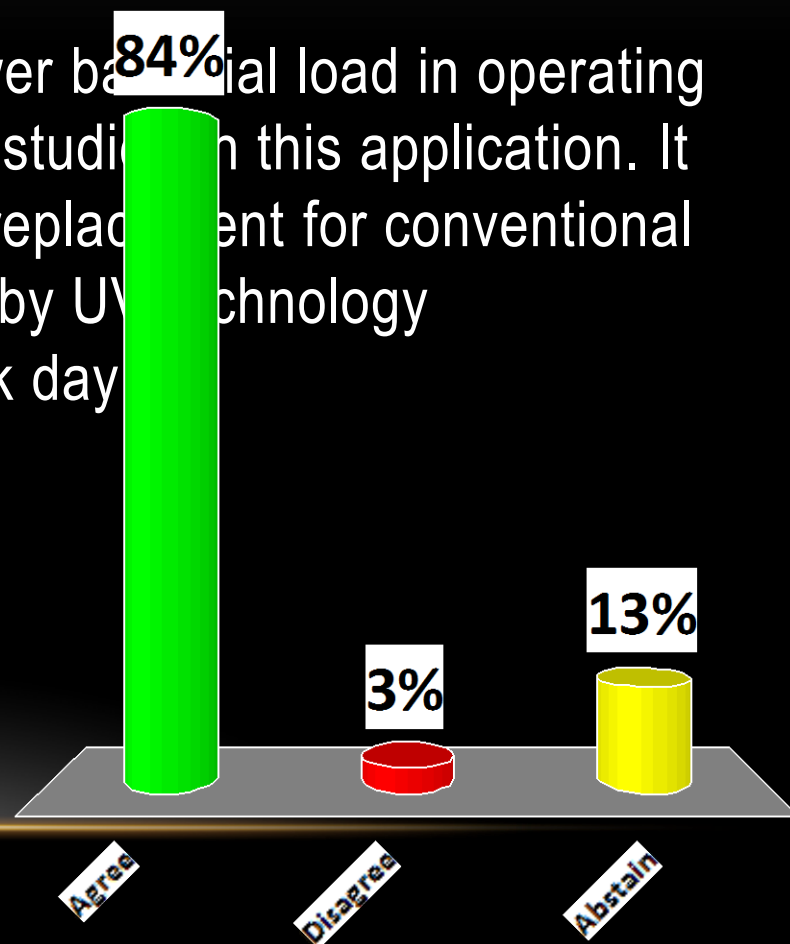


WG IV

Question 8: Do UV decontamination/sterilization lights or portable units used in unoccupied theatres (nights and weekends) make a difference in the sterility of the OR environment?

Consensus: UV would be expected to lower bacterial load in operating theatres, but the technology has not been studied in this application. It might be considered an adjunct but not a replacement for conventional cleaning. There are potential risks to staff by UV technology inadvertently left on at the start of the work day.

- A. Agree
- B. Disagree
- C. Abstain

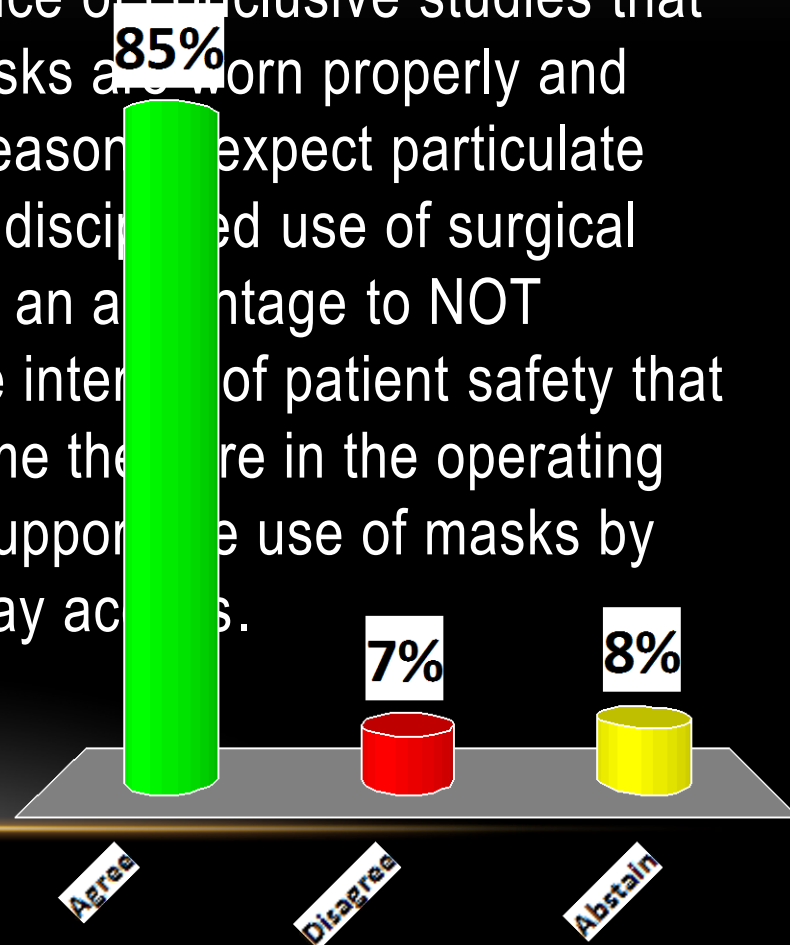


WG IV

Question 9: Should the patient wear a mask to avoid contamination of the OR air?

Consensus: Literature: Despite the absence of conclusive studies that show a reduction in SSI when surgical masks are worn properly and uniformly by all staff, we believe there is reason to expect particulate airborne bacteria counts to be reduced by disciplined use of surgical masks. Until evidence appears that shows an advantage to NOT wearing a mask, we believe that it is in the interest of patient safety that all personnel wear surgical masks at all time they are in the operating theatre. There is insufficient evidence to support the use of masks by patients that outweighs the benefit of airway access.

- A. Agree
- B. Disagree
- C. Abstain

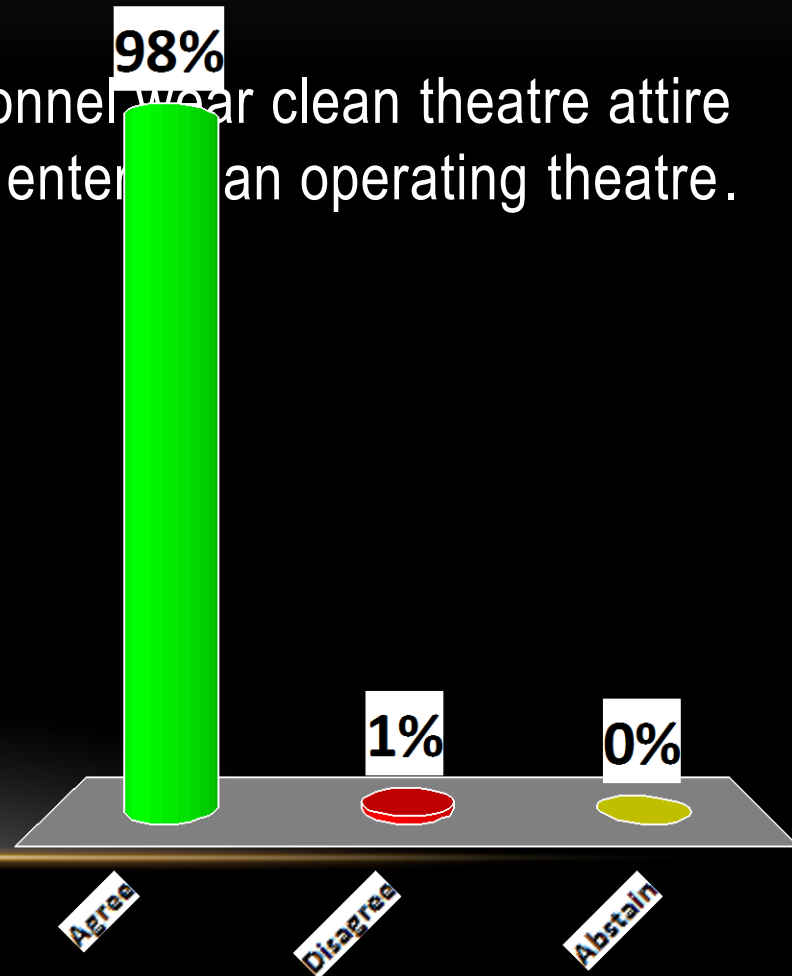


WG IV

Question 10: What garments are required for operating room personnel?

Consensus: We recommend that all personnel wear clean theatre attire including disposable head covering, when entering an operating theatre.

- A. Agree
- B. Disagree
- C. Abstain

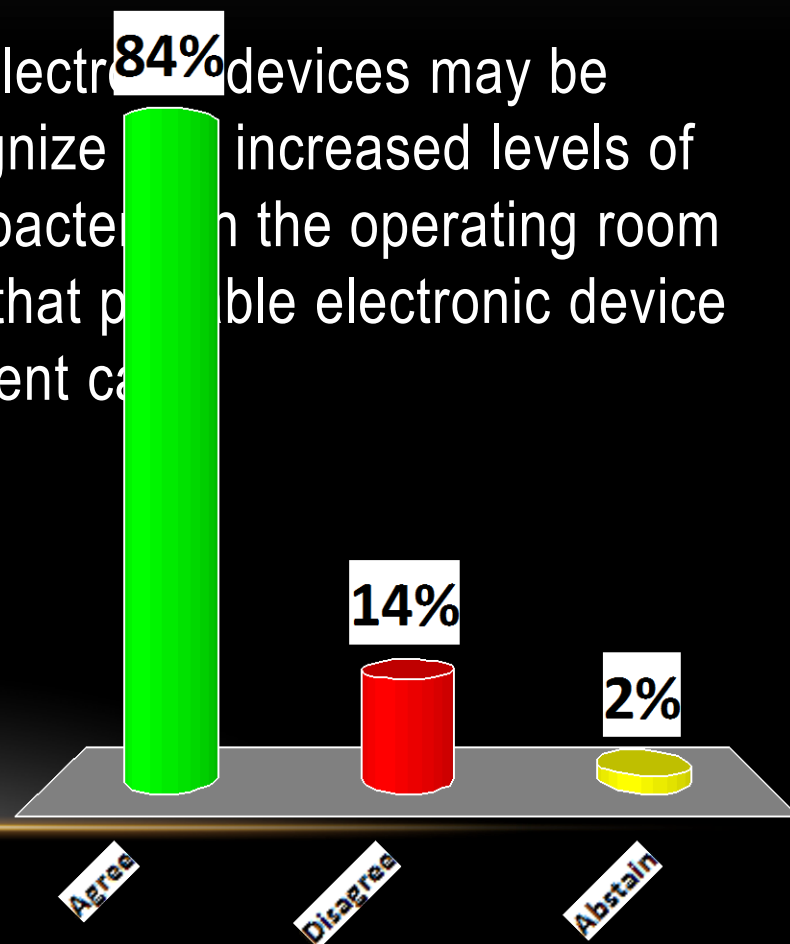


WG IV

Question 11: What restrictions should be placed on the use of portable electronic devices (such as mobile phones, laptops, tablets, or music devices) in the operating room?

Consensus: We recognize that portable electronic devices may be contaminated with bacteria. We also recognize that increased levels of talking is associated with higher levels of bacteria in the operating room environment. Accordingly we recommend that portable electronic device usage be limited to that necessary for patient care.

- A. Agree
- B. Disagree
- C. Abstain

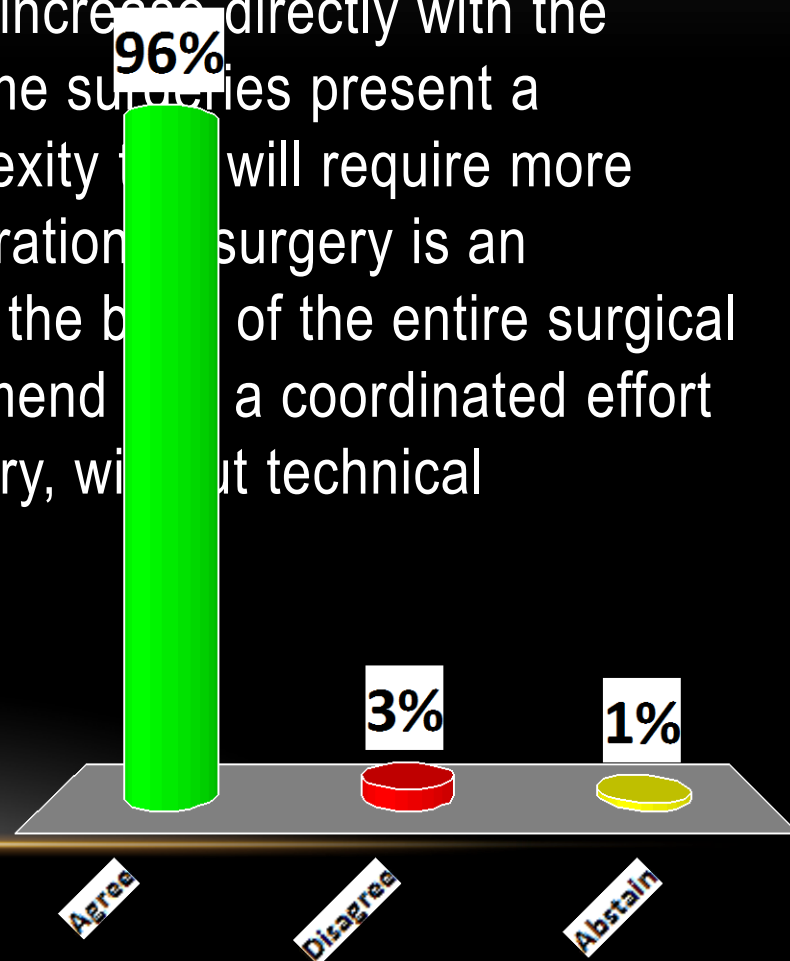


WG IV

Question 12: Does prolonged surgical time predispose to an increased risk of PJI?

Consensus: We recognize that SSI rates increase directly with the duration of surgery. We recognize that some surgeries present a significant and inescapable level of complexity that will require more time. We recognize that minimizing the duration of surgery is an important goal and a cooperative effort on the behalf of the entire surgical team as well as the institution. We recommend that a coordinated effort be made to minimize the duration of surgery, without technical compromise of the procedure.

- A. Agree
- B. Disagree
- C. Abstain

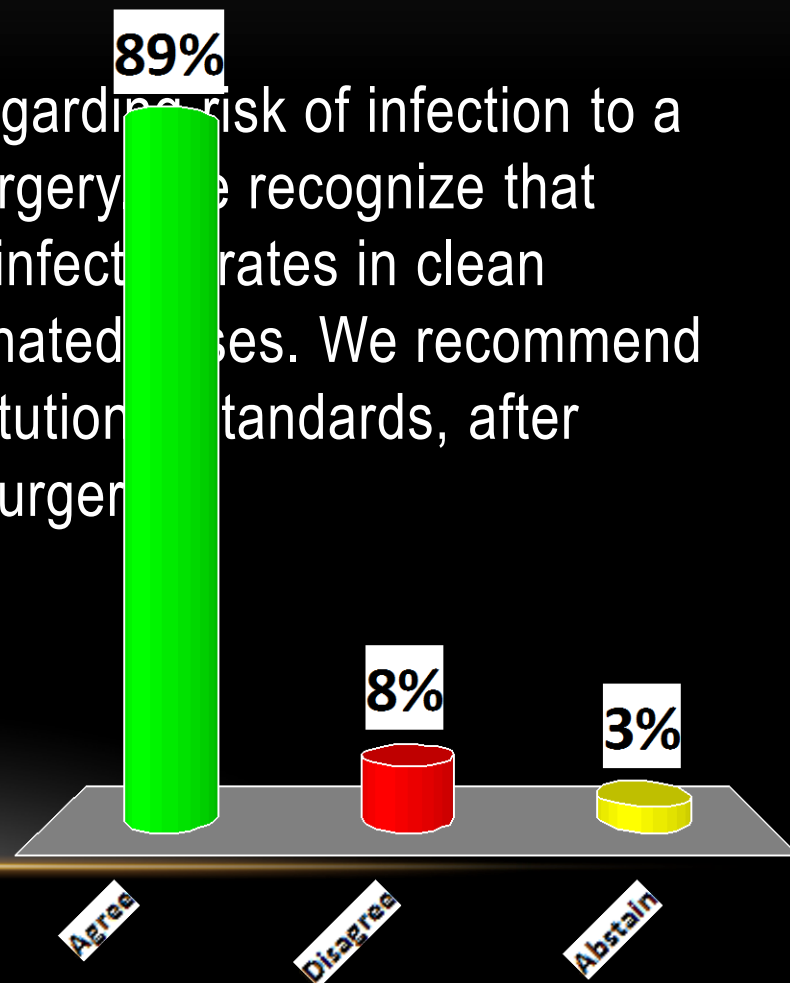


WG IV

Question 13: Should the scheduling of elective TJA be ordered such that clean cases are not preceded by known infected, dirty, or contaminated cases?

Consensus: We recognize the concern regarding risk of infection to a clean surgery following a contaminated surgery. We recognize that studies have not demonstrated increased infection rates in clean surgery performed subsequent to contaminated cases. We recommend thorough cleaning as defined by local institutional standards, after contaminated surgery and before further surgery.

- A. Agree
- B. Disagree
- C. Abstain

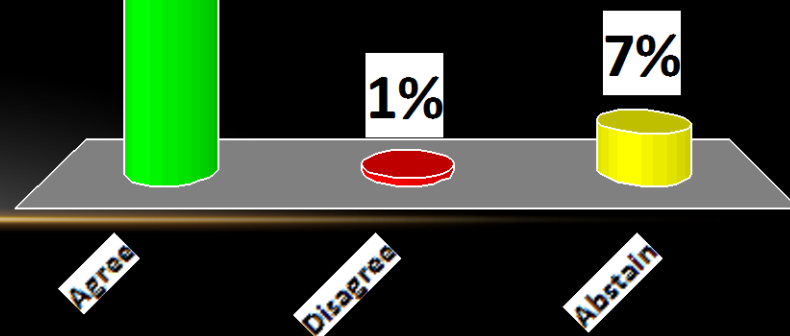


WG IV

Question 14: Does patient normothermia have an essential role in preventing infectious complications?

Consensus: We recognize the significance of patient normothermia and the data from nonorthopedic procedures. We support general recommendations from the General Surgery literature and identify this as a field that requires further research.

- A. Agree
- B. Disagree
- C. Abstain

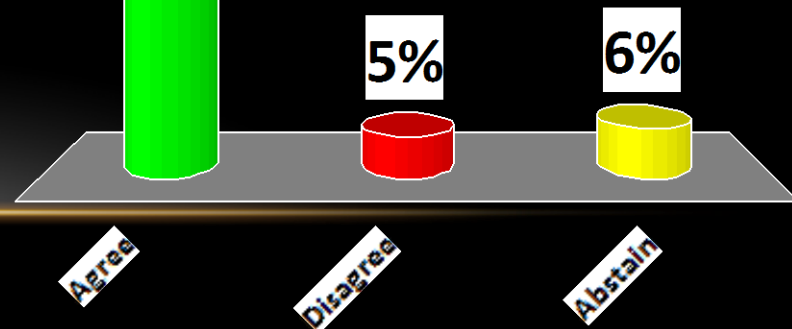


WG IV

Question 15: Do Forced Air Warming (FAW) blankets increase the risk of SSI?

Consensus: We recognize the theoretical risk posed by forced air warming blankets and the fact that no studies have shown an increase in SSI related to the use of these devices. We recommend further study but no change to current practice.

- A. Agree
- B. Disagree
- C. Abstain

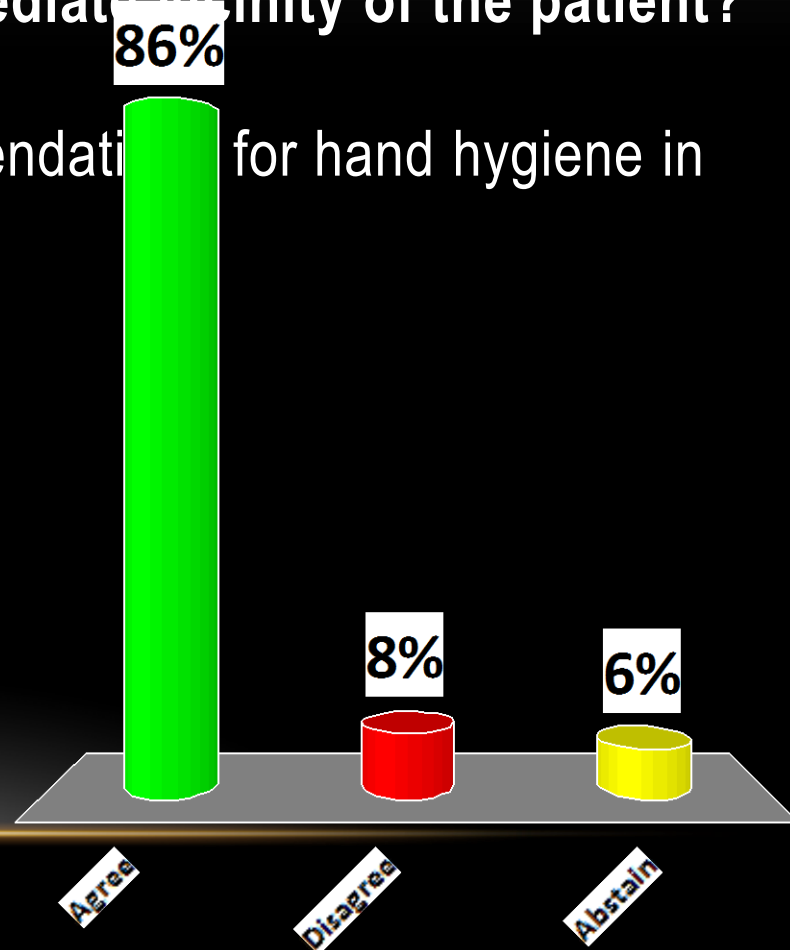


WG IV

Question 16: Should OR personnel be required to decontaminate their hands with at least an alcohol-based foam every time their hands have been in contact with inanimate objects (including medical equipment) located in the immediate vicinity of the patient?

Consensus: We support current recommendations for hand hygiene in patient care.

- A. Agree
- B. Disagree
- C. Abstain

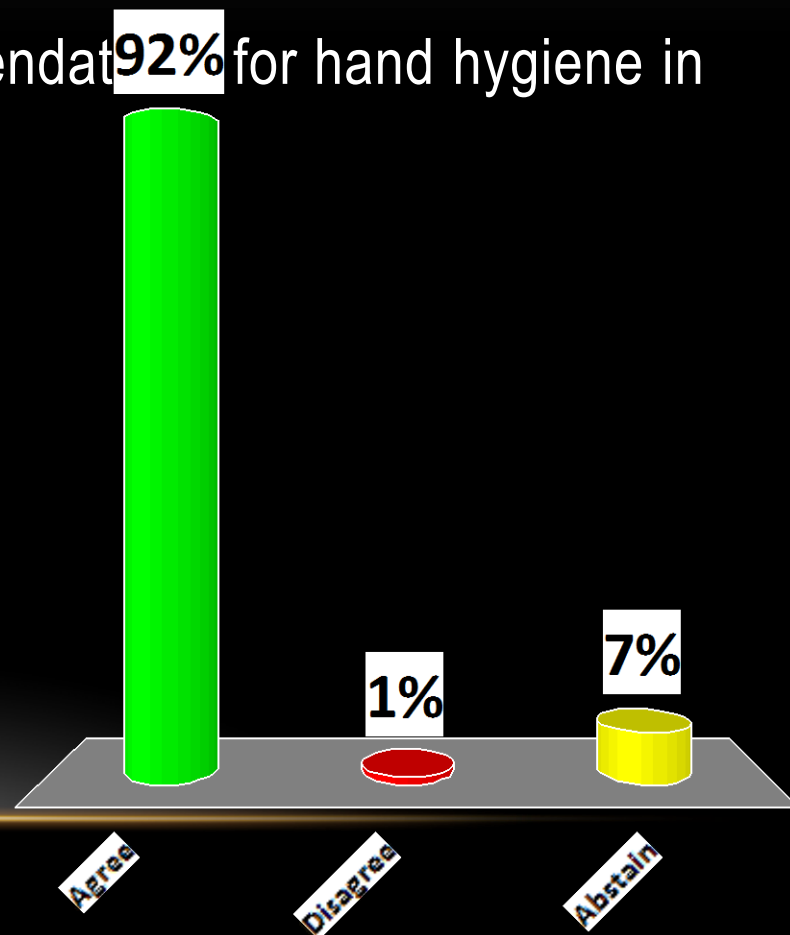


WG IV

Question 17: What are the guidelines for hand hygiene and glove use for personnel in contact with the patient for examination, manipulation, and placement on the OR table?

Consensus: We support current recommendations for hand hygiene in patient care.

- A. Agree
- B. Disagree
- C. Abstain

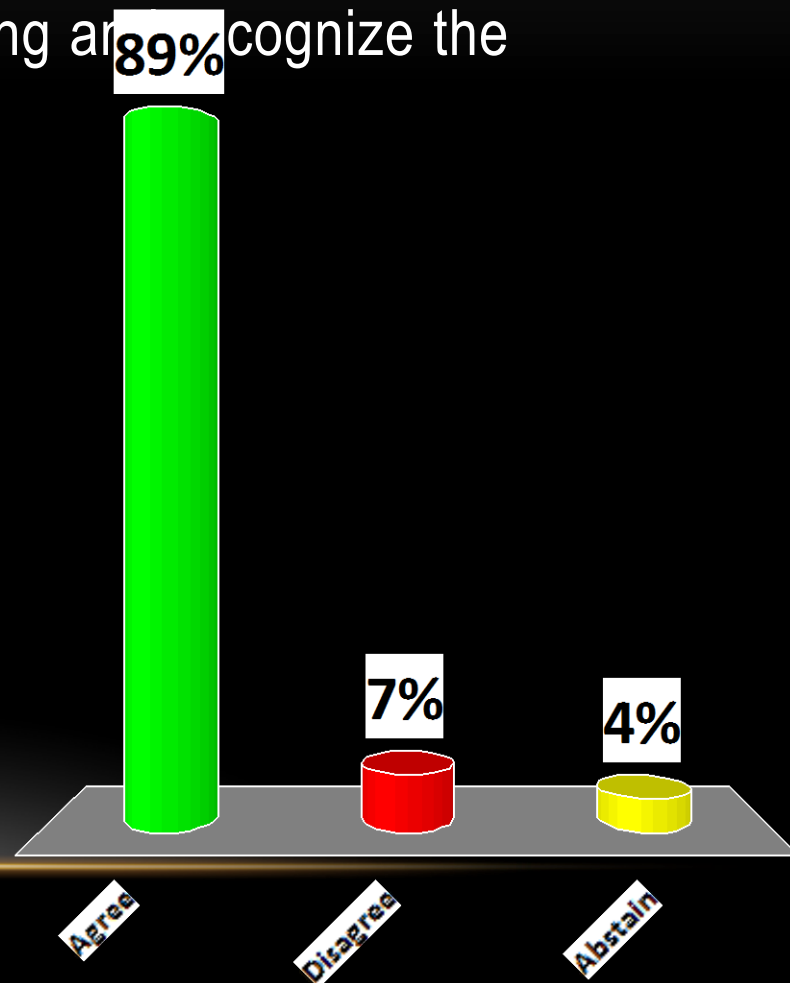


WG IV

Question 18: Should triple gloving be used to prevent contamination during TJA?

Consensus: We recommend double gloving and recognize the theoretical advantage of triple gloving.

- A. Agree
- B. Disagree
- C. Abstain

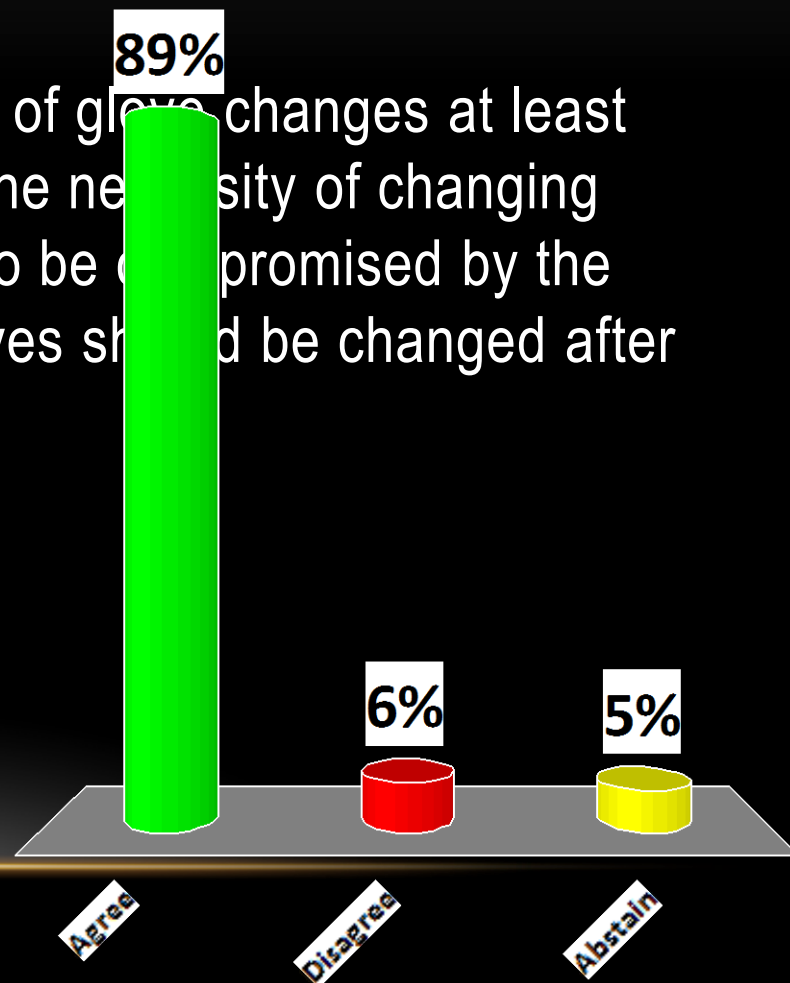


WG IV

Question 19: How frequently should gloves be changed during surgery?

Consensus: We recognize the advantage of glove changes at least every 90 minutes or more frequently and the necessity of changing perforated gloves. Permeability appears to be compromised by the exposure to methacrylate cement and gloves should be changed after cementation.

- A. Agree
- B. Disagree
- C. Abstain

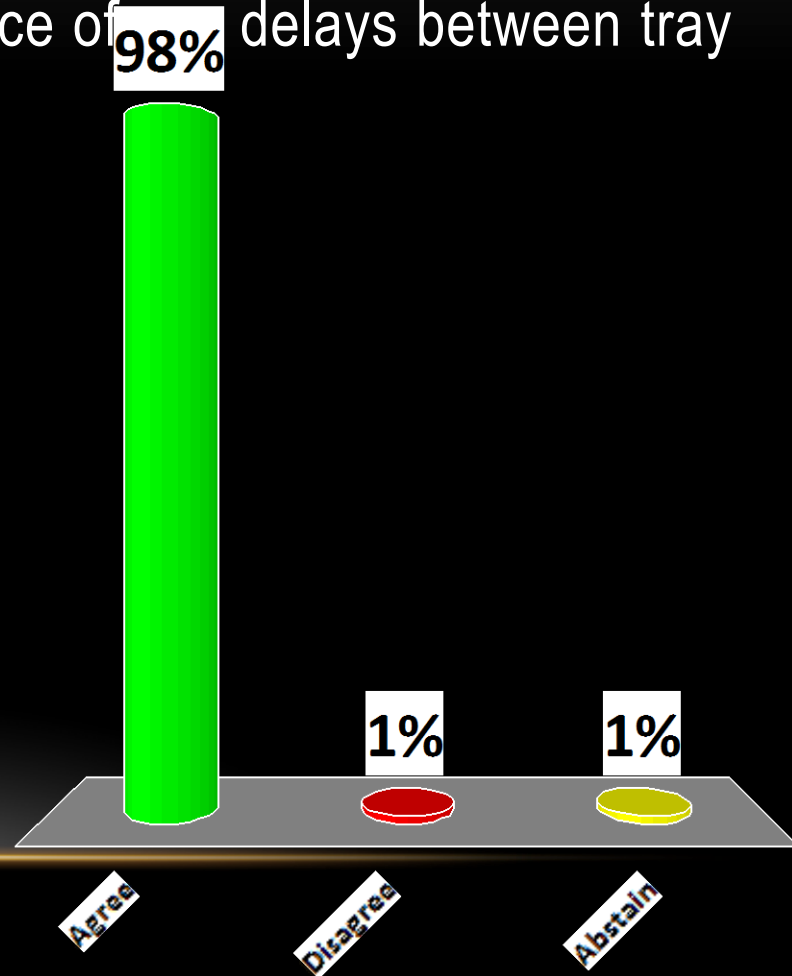


WG IV

Question 20: When should instrument trays be opened?

Consensus: We recommend that trays should be opened as close to the surgical case as possible with avoidance of delays between tray opening and start of surgery.

- A. Agree
- B. Disagree
- C. Abstain

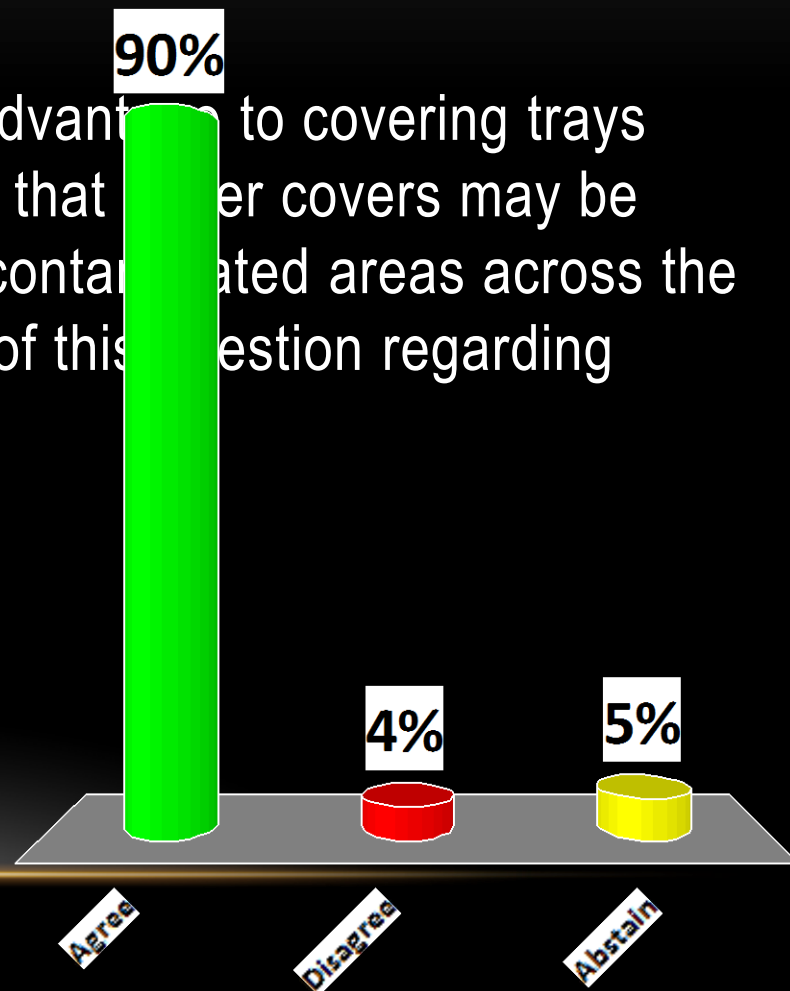


WG IV

Question 21: Should trays be covered with sterile drapes/towels when not in use?

Consensus: We recognize a theoretical advantage to covering trays when not in use for extended periods, and that paper covers may be disadvantageous, if they are moved from contaminated areas across the sterile field. We recommend further study of this question regarding timing and techniques.

- A. Agree
- B. Disagree
- C. Abstain

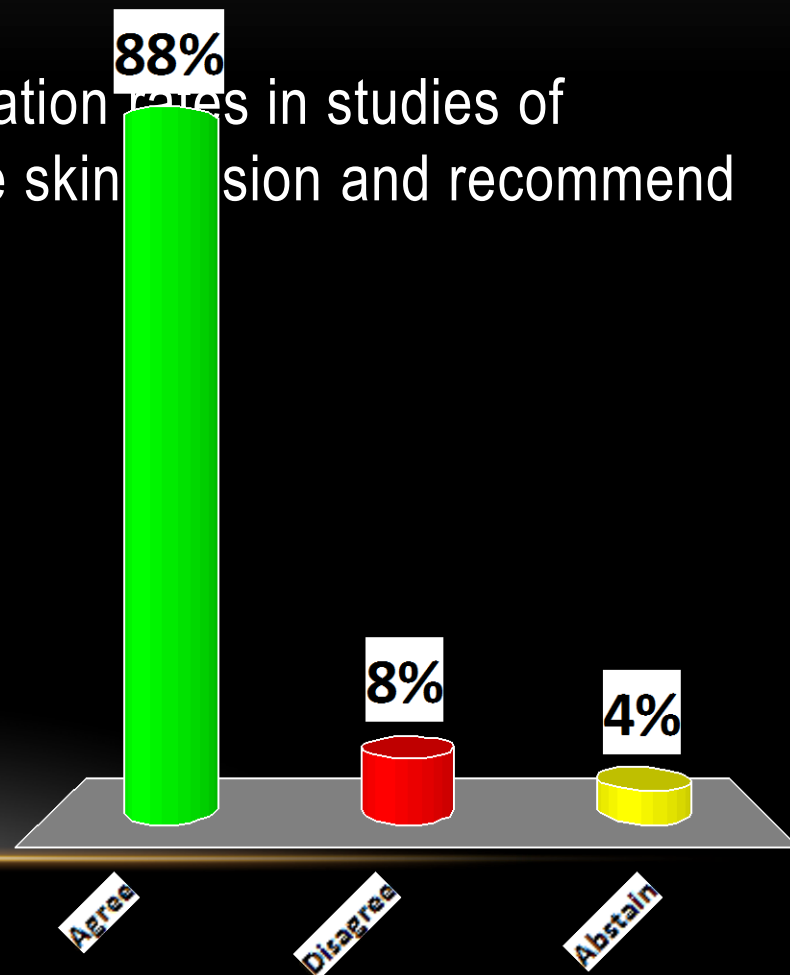


WG IV

Question 22: After skin incision, should the knife blade be changed for deeper dissections?

Consensus: We recognize high contamination rates in studies of scalpel blades that have been used for the skin incision and recommend changes after skin incision.

- A. Agree
- B. Disagree
- C. Abstain

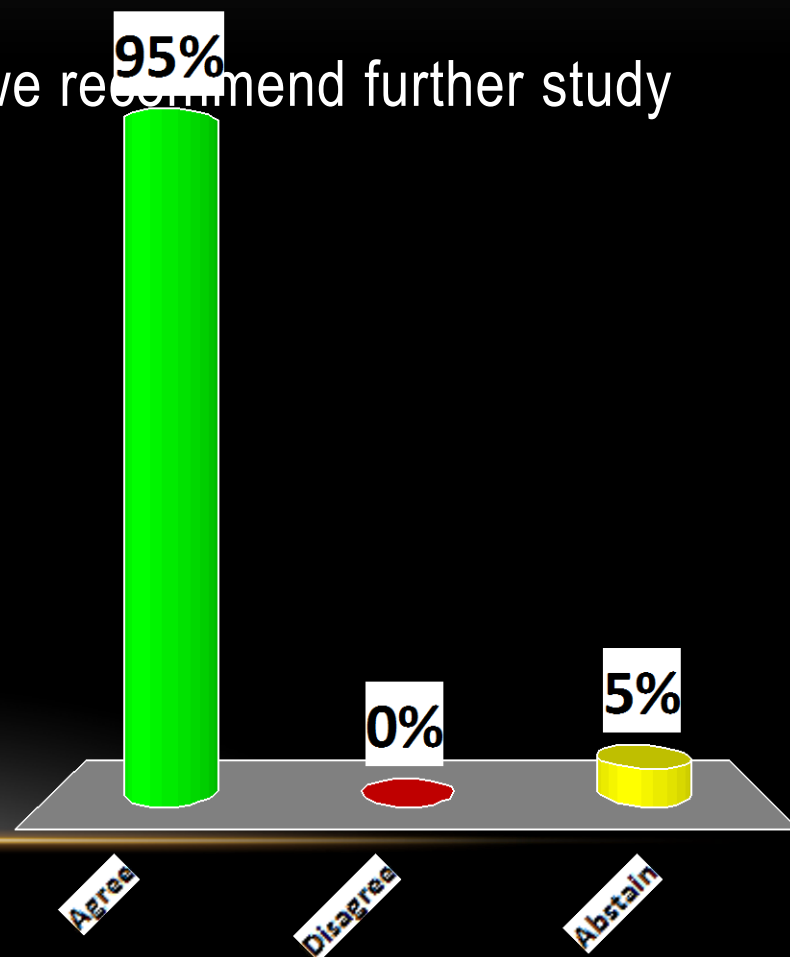


WG IV

Question 23: Should electrocautery tips be changed during TJA? If so, how often?

Consensus: In the absence of evidence we recommend further study and no specific behavior.

- A. Agree
- B. Disagree
- C. Abstain

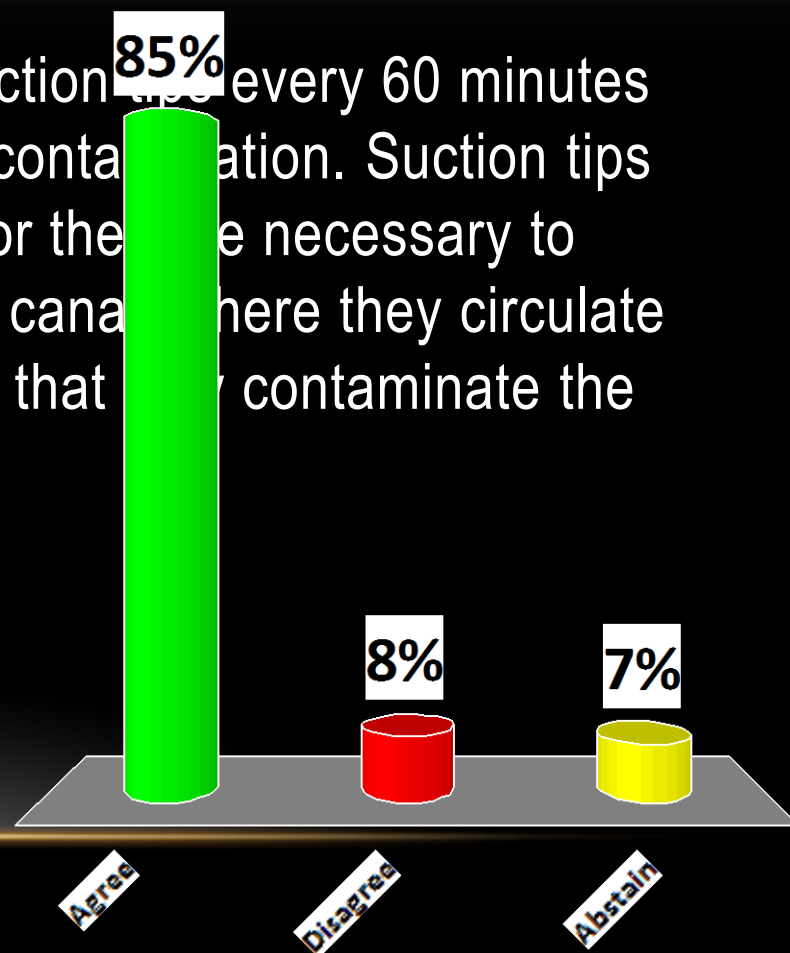


WG IV

Question 24: Should suction tips be regularly changed during surgery? If so, how frequently? Should suction tips enter the femoral canal?

Consensus: We recommend changing suction tips every 60 minutes based on studies showing higher rates of contamination. Suction tips can be introduced into the femoral canal for the time necessary to evacuate fluid but should not be left in the canal where they circulate large amounts of ambient air and particles that may contaminate the surgery.

- A. Agree
- B. Disagree
- C. Abstain

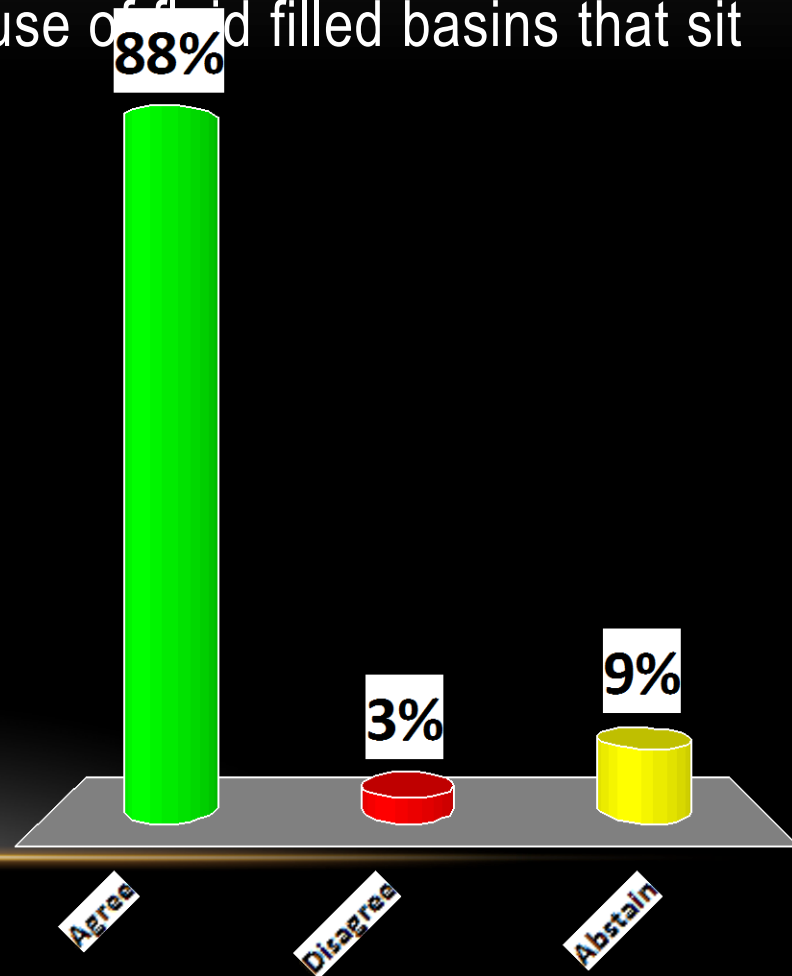


WG IV

Question 25: Should splash basins be used, as they are known to be a source of contamination?

Consensus: We recommend against the use of fluid filled basins that sit open during the surgery.

- A. Agree
- B. Disagree
- C. Abstain

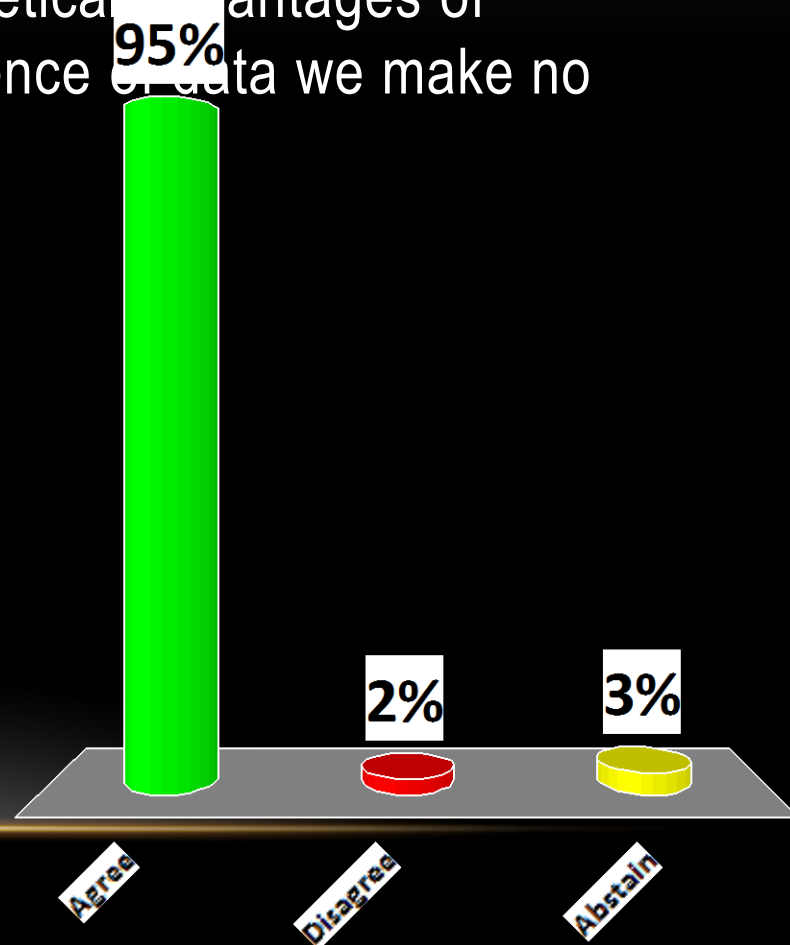


WG IV

Question 26: Do disposable instruments and cutting guides reduce contamination and subsequent PJI?

Consensus: We recognize possible theoretical advantages of disposable instrumentation but in the absence of data we make no recommendations.

- A. Agree
- B. Disagree
- C. Abstain

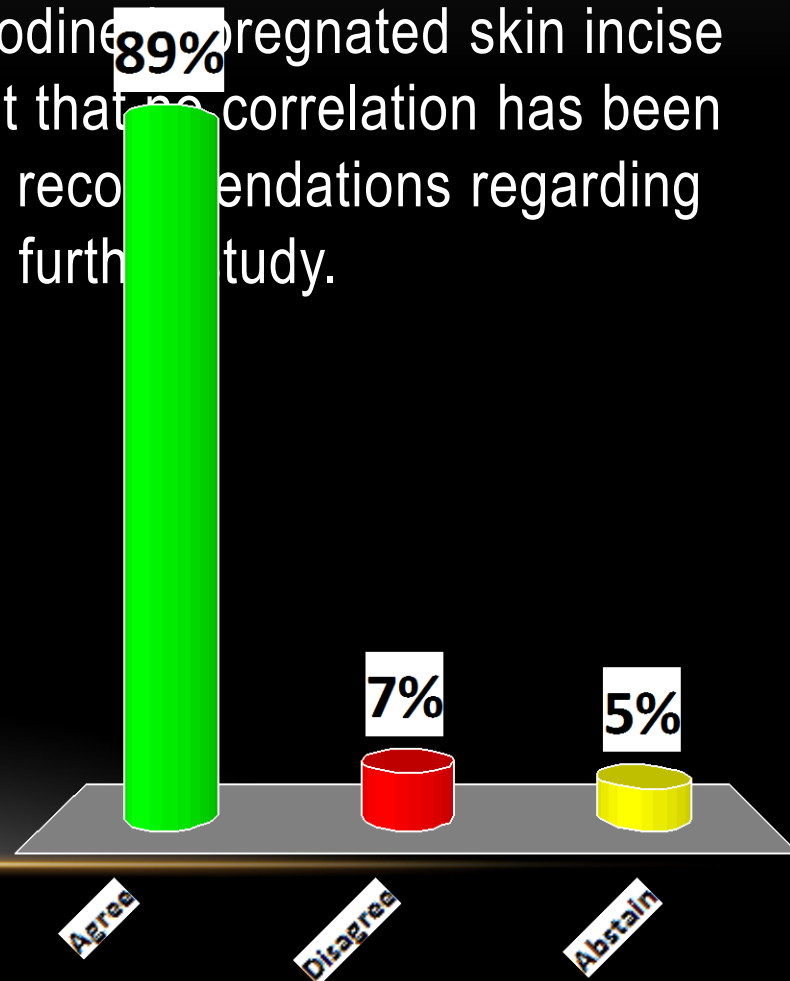


WG IV

Question 27: Is there a role for incise draping? What type of incise draping should be used (impregnated or clear)?

Consensus: We recognize studies show iodine impregnated skin incise drapes decreased skin bacterial counts but that no correlation has been established with SSI. We do not make any recommendations regarding the use of skin barriers but do recommend further study.

- A. Agree
- B. Disagree
- C. Abstain

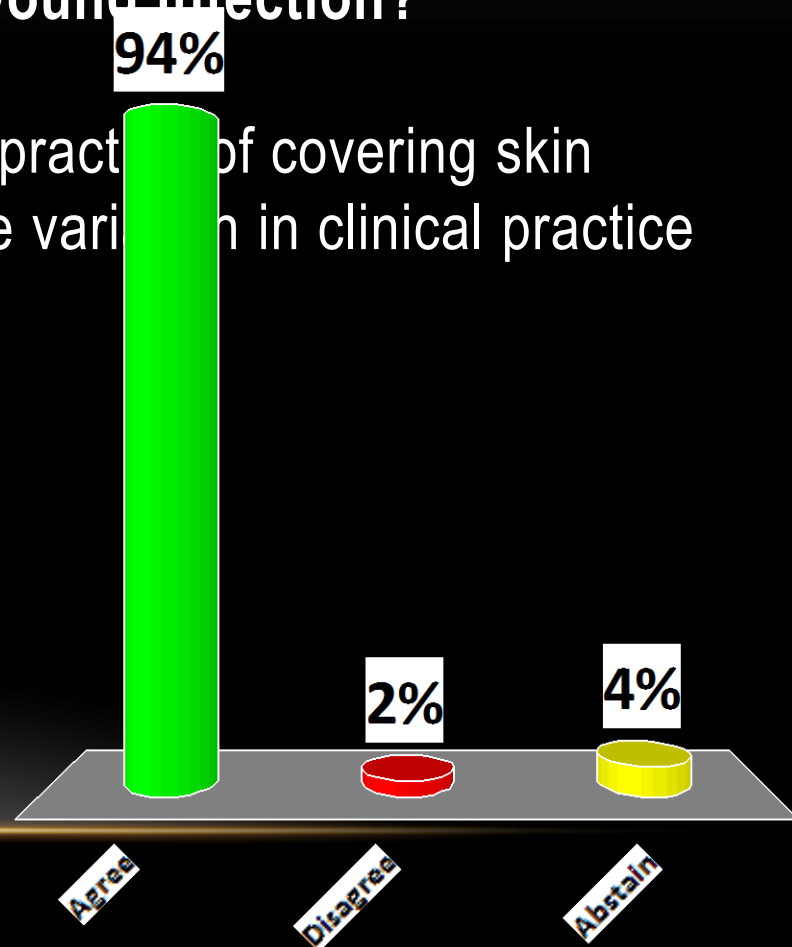


WG IV

Question 28: Does the application of towels or other sterile materials to wound edges and subcutaneous fat during an operation, clipped securely to the edges of the wound, diminish the chances of wound contamination and wound infection?

Consensus: We recognize the traditional practice of covering skin edges with sterile draping but there is wide variation in clinical practice and we make no recommendations.

- A. Agree
- B. Disagree
- C. Abstain

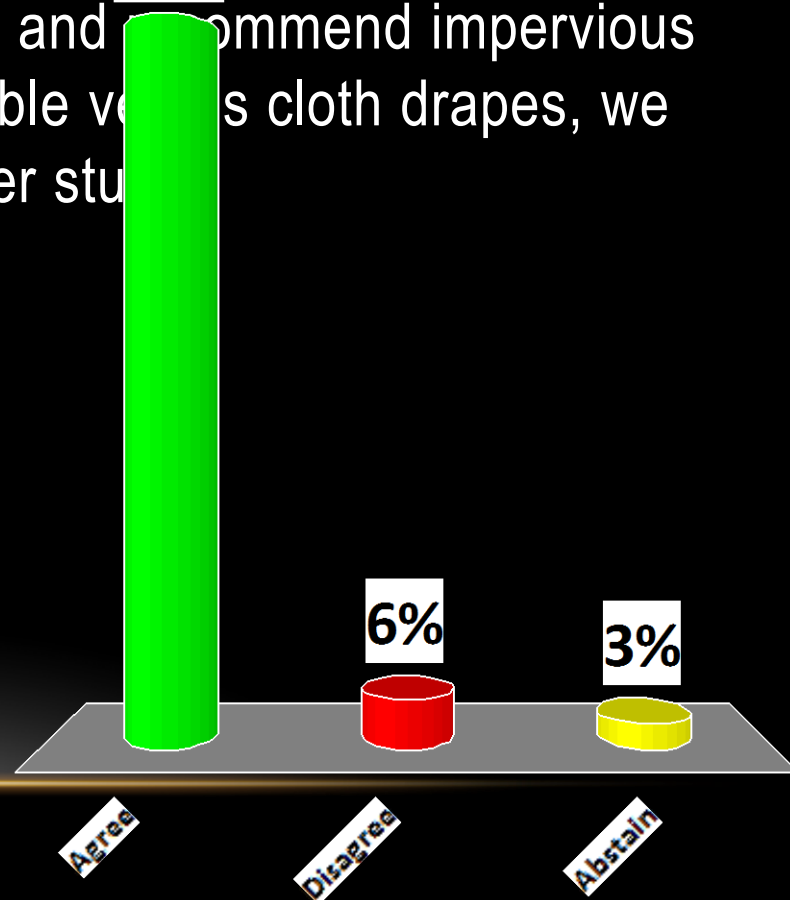


WG IV

Question 29: What type of draping should be used (reusable or disposable)?

Consensus: We recognize that penetration of 90%es by liquids is believed to be equivalent to contamination and recommend impervious drapes. In the absence of data on disposable versus cloth drapes, we make no recommendation except for further study.

- A. Agree
- B. Disagree
- C. Abstain

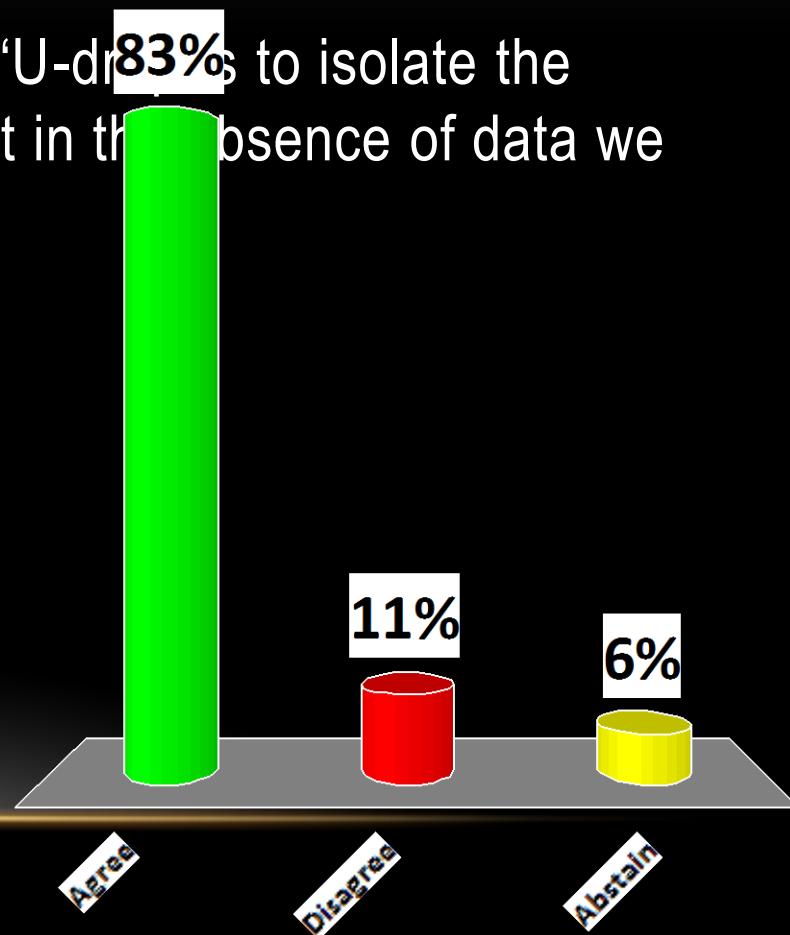


WG IV

Question 30: Is there evidence that the use of sticky U drapes, applied before and after prepping, effectively seals the non-prepped area from the operative field?

Consensus: We recognize that adhesive “U-drapes to isolate the perineum” has been traditional practice but in the absence of data we make no recommendations.

- A. Agree
- B. Disagree
- C. Abstain

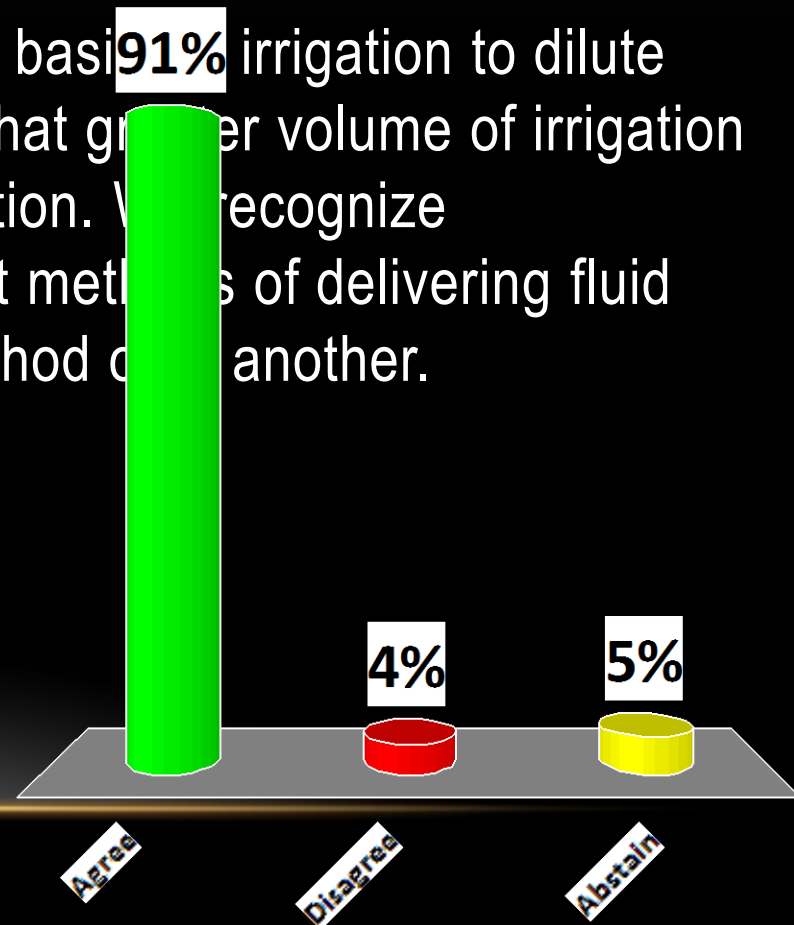


WG IV

Questions 31: Is irrigation useful? How should the delivery method for irrigation fluid be?

Consensus: We recognize the theoretical basis for irrigation to dilute contamination and non-viable tissue and that greater volume of irrigation would be expected to achieve greater dilution. We recognize advantages and disadvantages of different methods of delivering fluid but make no recommendations of one method over another.

- A. Agree
- B. Disagree
- C. Abstain

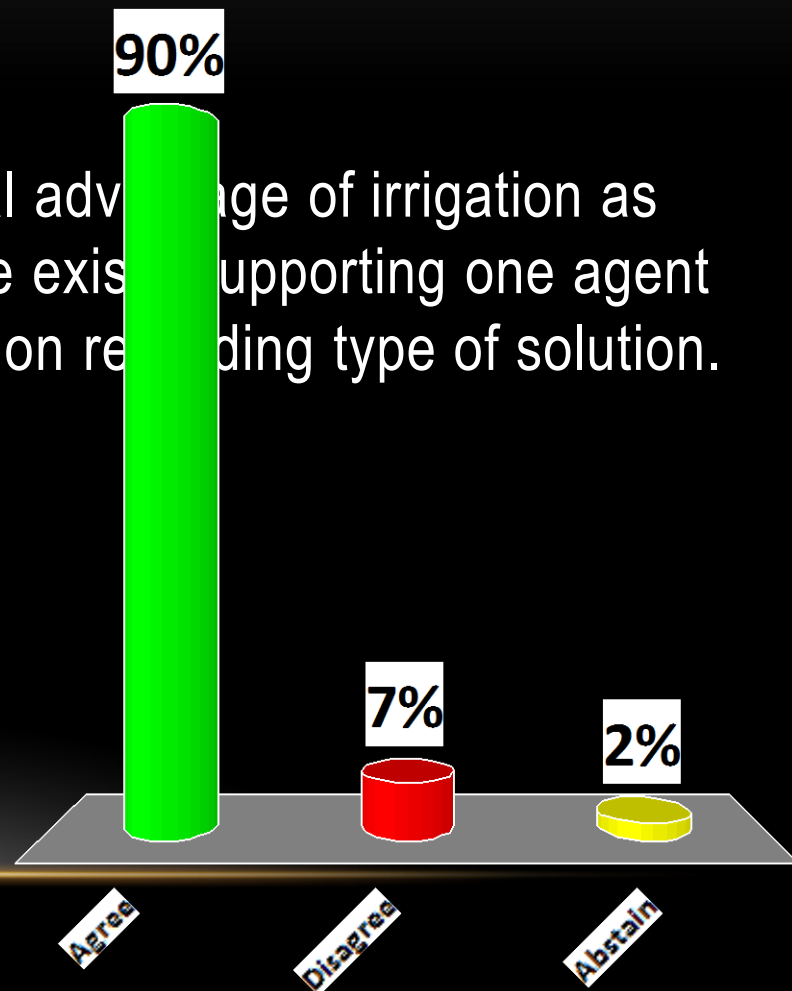


WG IV

Question 32: What irrigation solution should be used? Should antibiotics be added to the irrigation solution?

Consensus: We recognize the mechanical advantage of irrigation as per section 31 but that conflicting evidence exists supporting one agent over the other and make no recommendation regarding type of solution.

- A. Agree
- B. Disagree
- C. Abstain

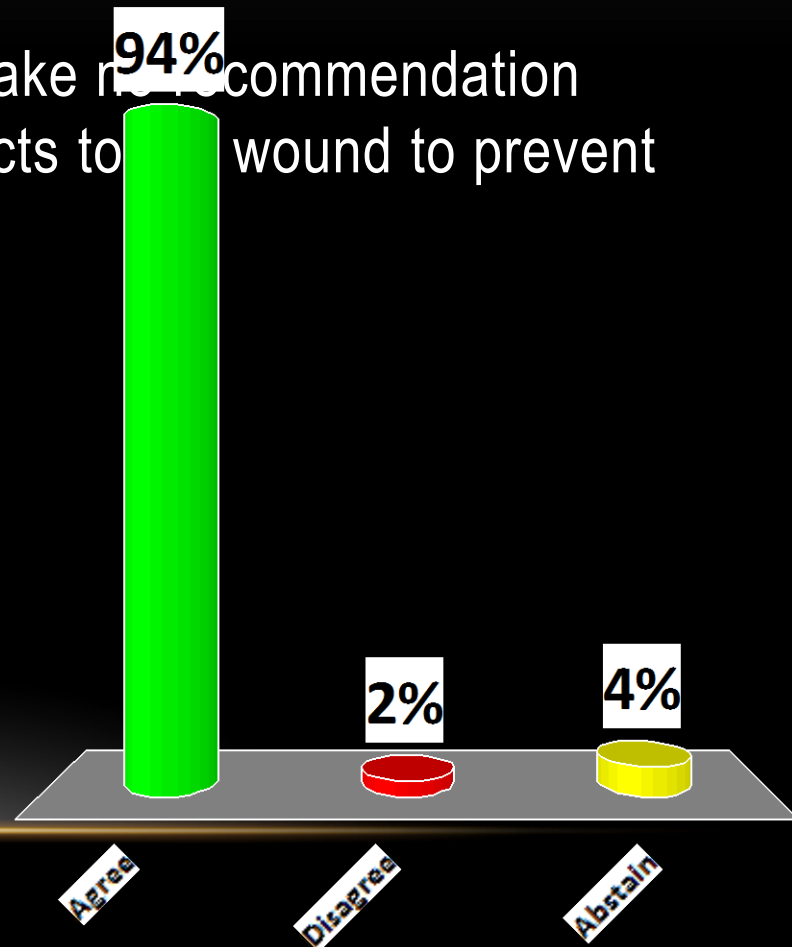


WG IV

Question 33: Is there a role for intraoperative application of autologous blood-derived products to the wound in preventing infection?

Consensus: In the absence of data we make no recommendation regarding autologous blood derived products to the wound to prevent infection.

- A. Agree
- B. Disagree
- C. Abstain

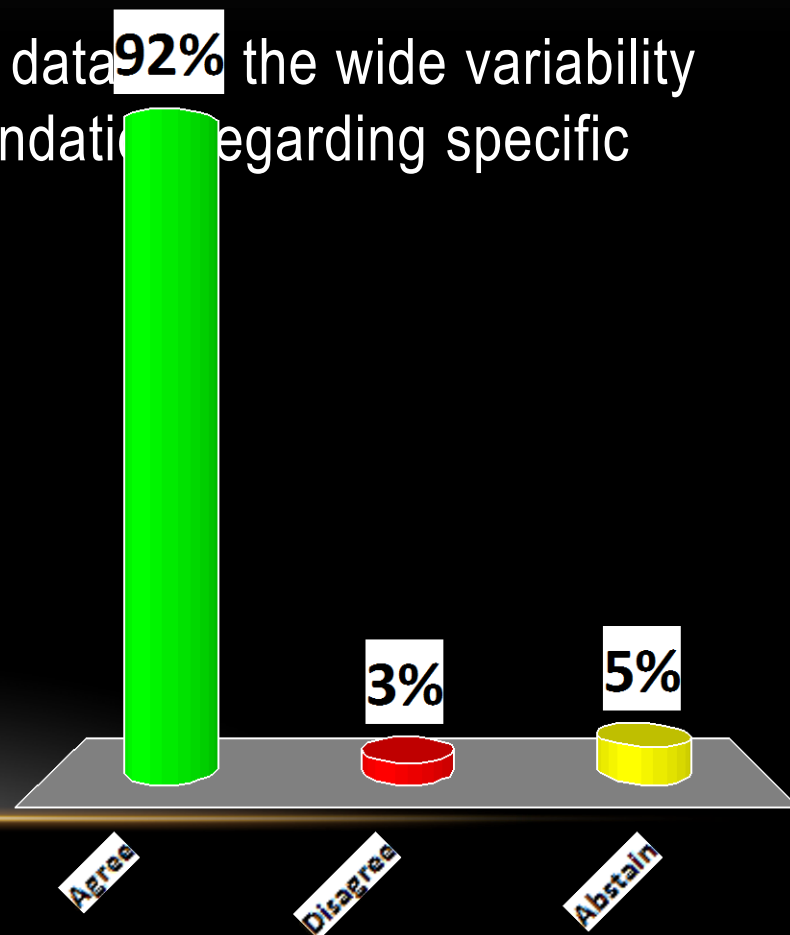


WG IV

Question 34: Do staples or the type of suture have an effect on infectious events? If so, what is the best closure method to prevent infectious events?

Consensus: In the absence of conclusive data, the wide variability in surgical practice, we make no recommendation regarding specific sutures or staples to prevent infection.

- A. Agree
- B. Disagree
- C. Abstain

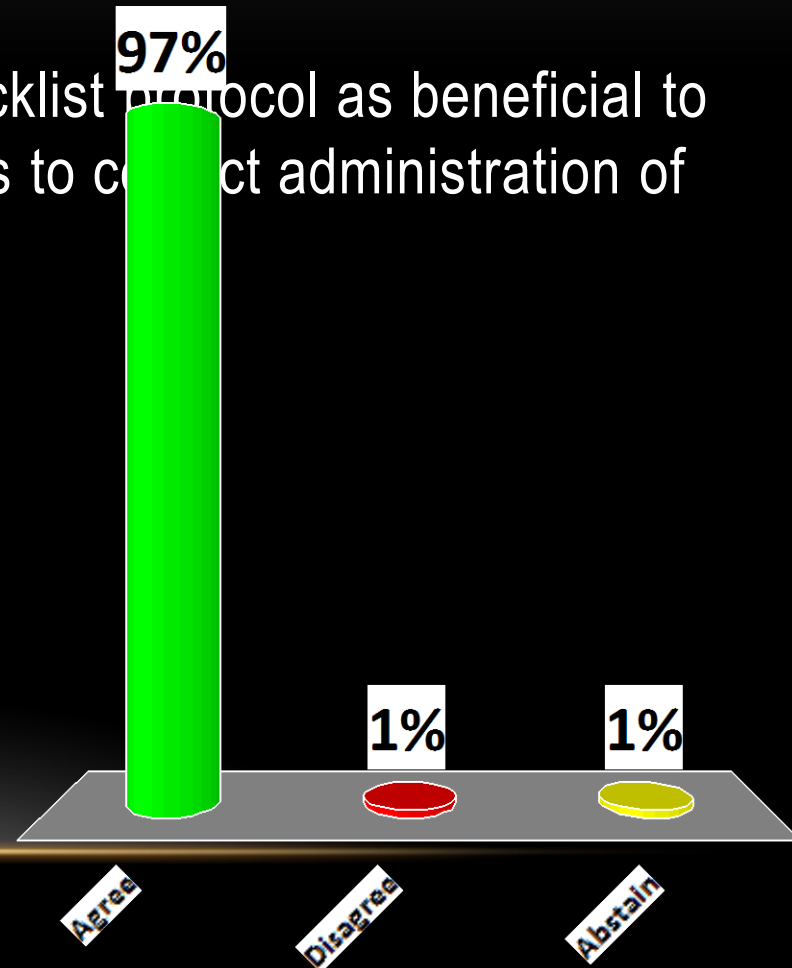


WG IV

Question 35: Does the use of a surgical safety checklist and time-out affect the rate of SSI in arthroplasty patients?

Consensus: We support the surgical checklist protocol as beneficial to patient safety, and specifically as it applies to correct administration of prophylactic antibiotics.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 5: BLOOD CONSERVATION

Liaison: Mohammad Rasouli MD

Leaders:

_Mercelina Gomez MD (International), Bryan Parsley (US)

Delegates:

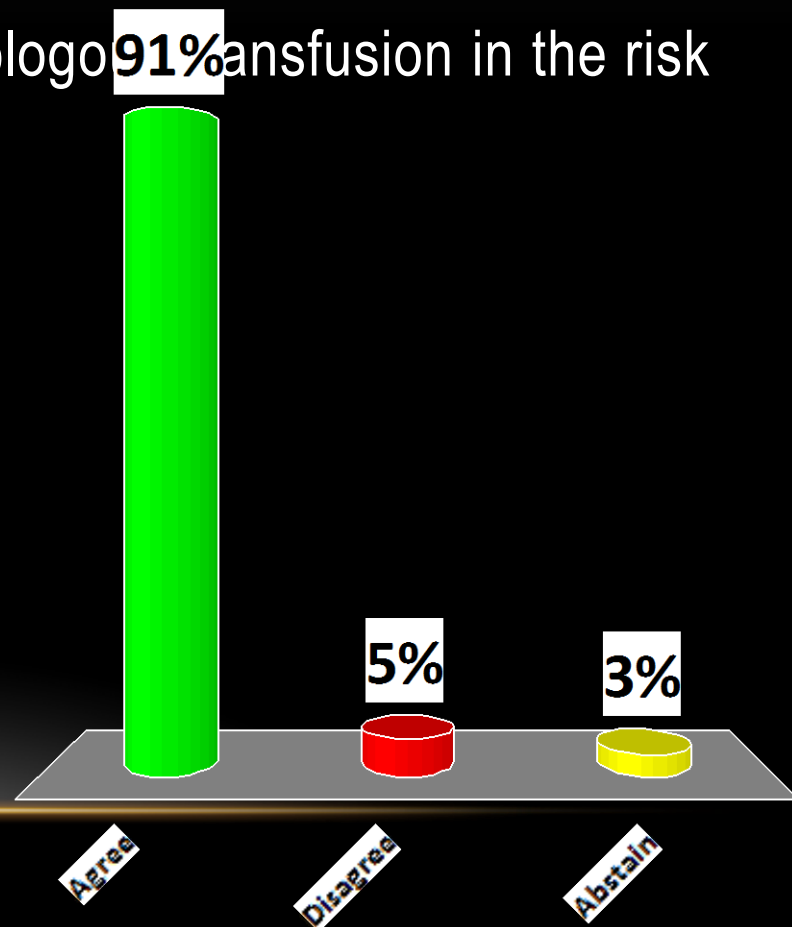
Wael Barsoum MD, Hari Bezwada MD, James Cashman MD, Julio Garcia MD, William Hamilton MD, Eric Hume MD, Raymond Kim MD, Tae Kyun Kim MD, Rajesh Malhotra MD, Stavros Memtsoudis MD, PhD, Alvin Ong MD, Fabio Orozco MD, Douglas Padgett MD, Ricardo Reina MD, Marco Teloken MD, Emmanuel Thienpont MD, Jonathan H Waters MD

WG V

Question 1: Is blood transfusion associated with an increased risk of surgical site infection (SSI)/periprosthetic joint infection (PJI)?

Consensus: Yes. Allogenic blood transfusions is associated with an increased risk of SSI/PJI . The role of autologous transfusion in the risk of SSI/PJI remains inconclusive..

- A. Agree
- B. Disagree
- C. Abstain

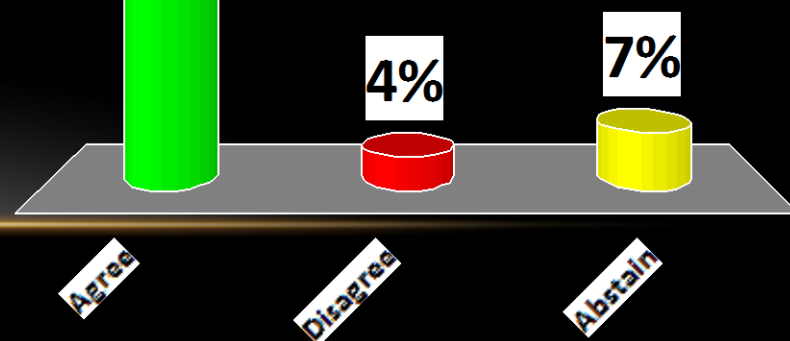


WG V

Question 2: What are the predictors of the need for allogenic blood transfusion in patients undergoing surgery for TJA?

Consensus: A lower preoperative hemoglobin **90%** is the strongest predictor for the potential use of allogenic transfusion after TJA. The use of general anesthesia, higher Charlson comorbidity index, female gender, and longer duration of surgery are predictors of the potential need for allogenic blood transfusion in patients undergoing total joint arthroplasty

- A. Agree
- B. Disagree
- C. Abstain

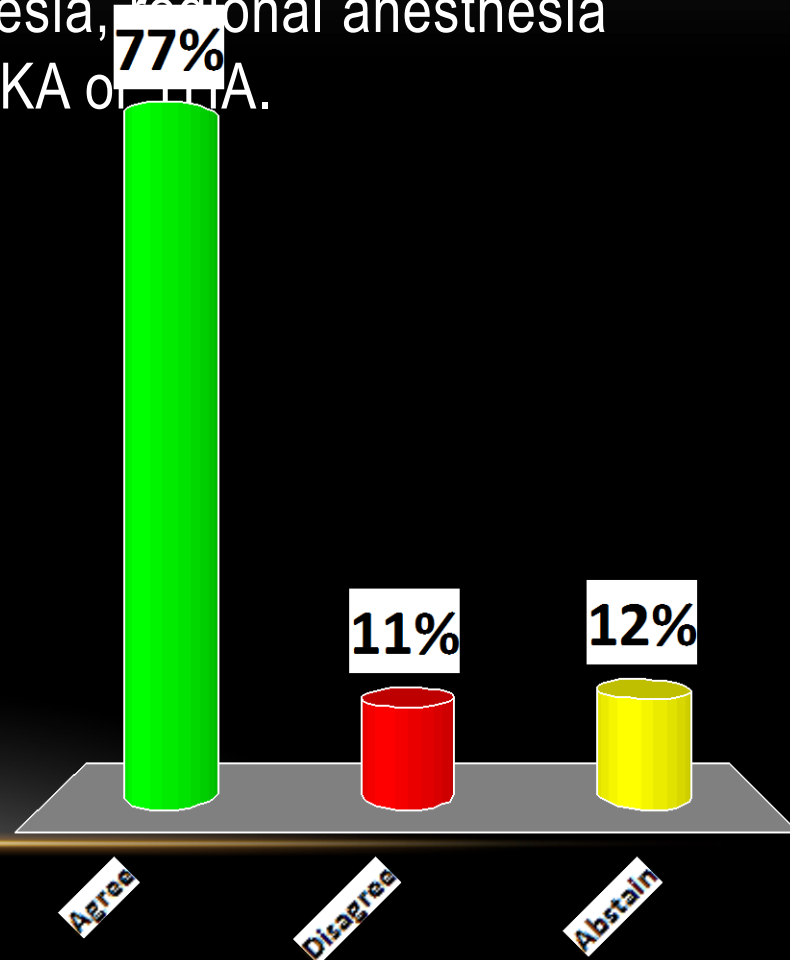


WG V

Question 3A: What is the role of type of anesthesia in minimizing blood loss and allogenic blood transfusion during surgery for PJI?

Consensus: Compared to general anesthesia, regional anesthesia reduces the amount of blood loss during TKA or THA.

- A. Agree
- B. Disagree
- C. Abstain

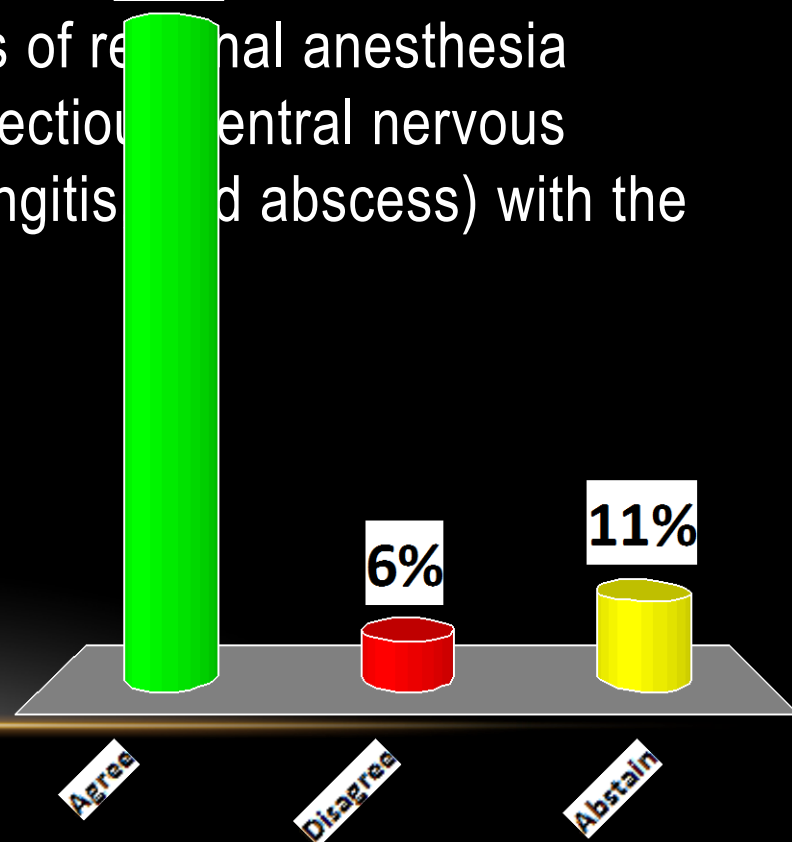


WG V

Question 3B: Is there evidence against neuraxial blockade in PJI cases (due to probable risk of spreading infection)?

Consensus: No. The decision to use regional versus general anesthesia in patients with PJI lies with the anesthesia team and needs to take into account the numerous benefits of regional anesthesia versus the potential for development of infectious central nervous system complications (arachnoiditis, meningitis, and abscess) with the use of regional anesthesia.

- A. Agree
- B. Disagree
- C. Abstain

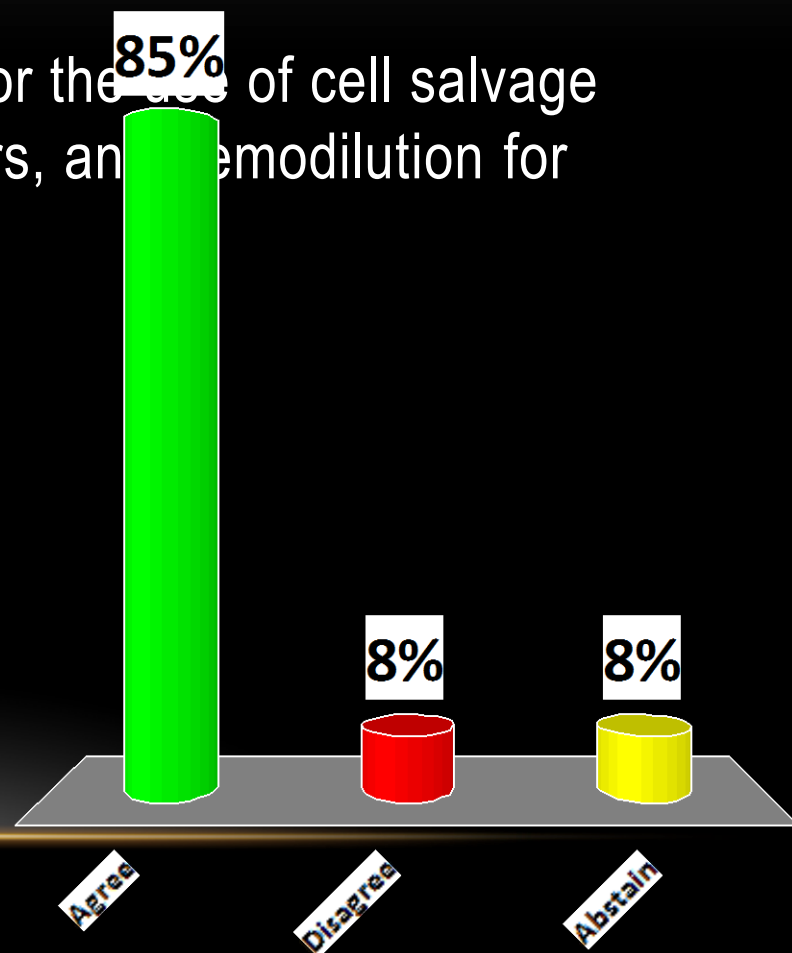


WG V

Question 4A: What is the role for adjuvant technologies including cell salvage systems, reinfusion drains, bipolar sealers, and hemodilution for minimizing blood loss during surgery for PJI?

Consensus: There is no defined benefit for the use of cell salvage systems, reinfusion drains, bipolar sealers, and hemodilution for management of PJI.

- A. Agree
- B. Disagree
- C. Abstain

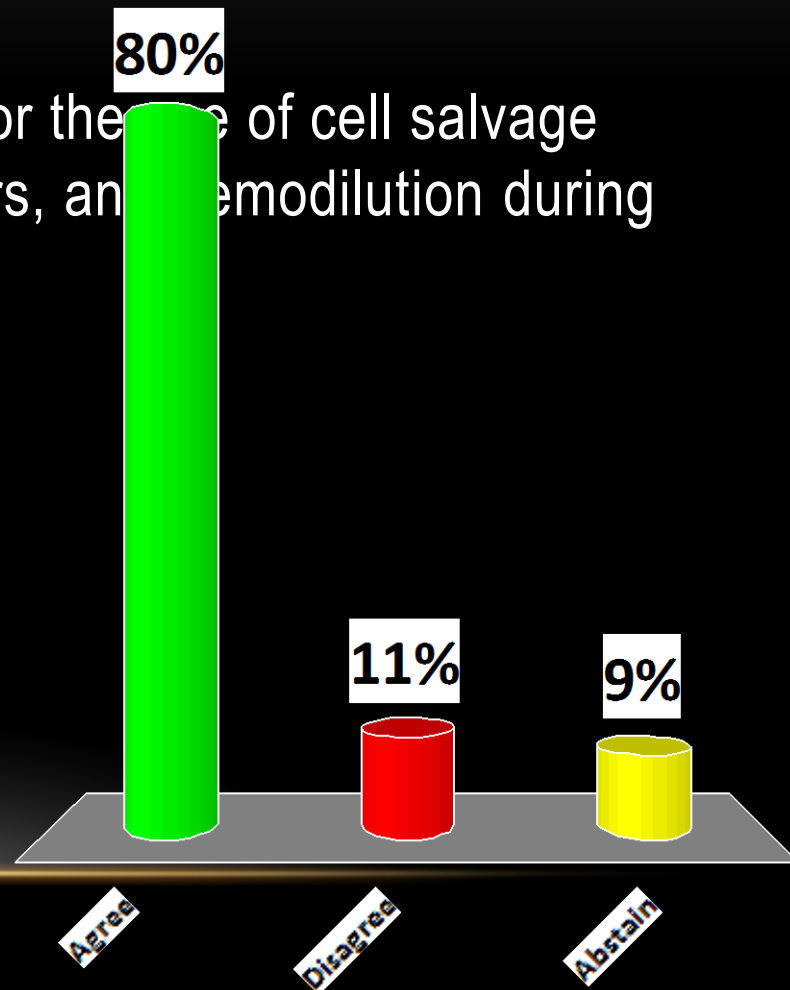


WG V

Question 4B: What is the role for adjuvant technologies including cell salvage systems, reinfusion drains, bipolar sealers, and hemodilution for minimizing blood loss during TJA?

Consensus: There is no defined benefit for the use of cell salvage systems, reinfusion drains, bipolar sealers, and hemodilution during TJA.

- A. Agree
- B. Disagree
- C. Abstain

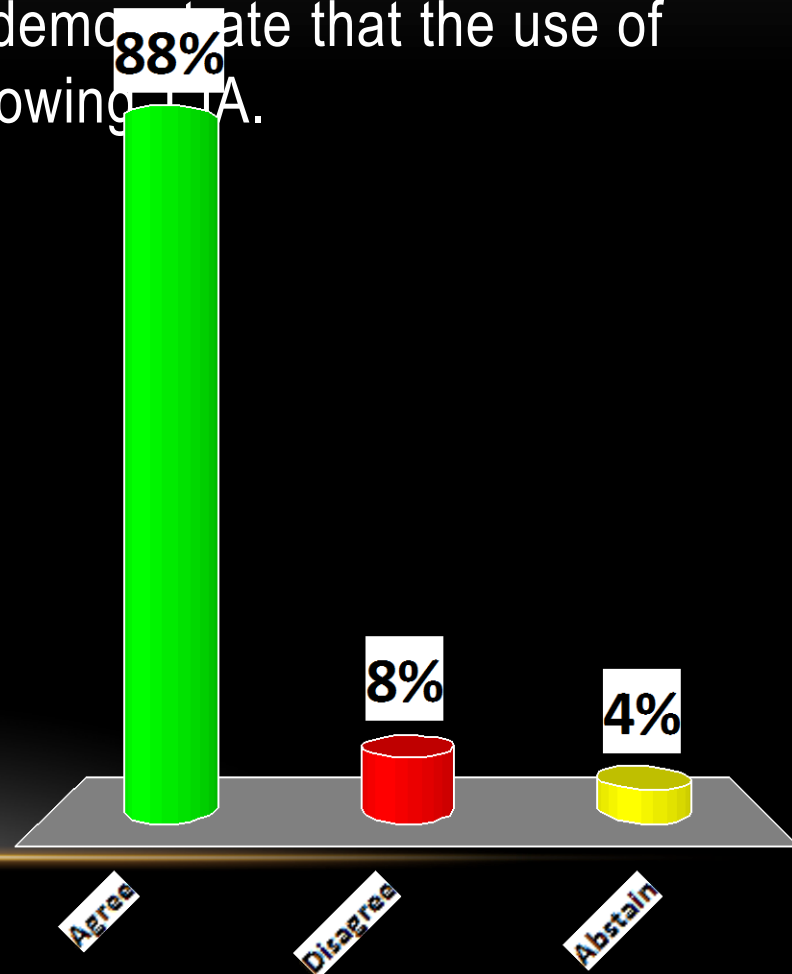


WG V

Question 5A: Does the use of a drain influence the incidence of SSI/PJI?

Consensus: No. There is no evidence to demonstrate that the use of closed drains increases the risk of SSI following TUA.

- A. Agree
- B. Disagree
- C. Abstain

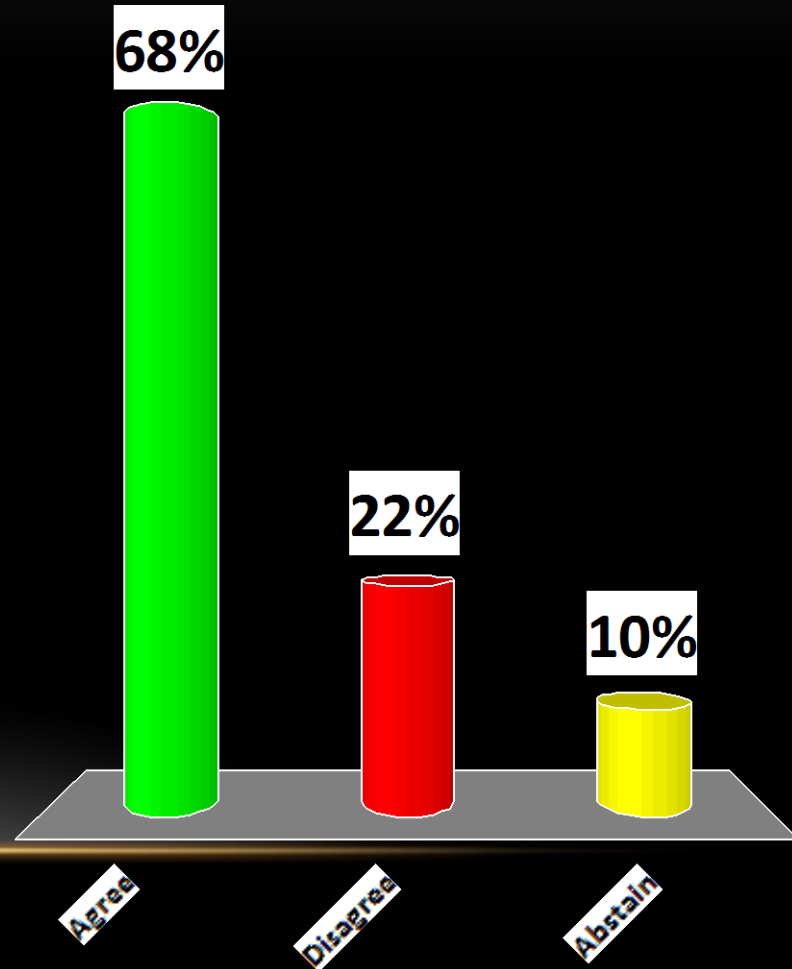


WG V

Question 5B: When should drain be removed?

Consensus: There is no conclusive evidence for the optimal timing of drain removal.

- A. Agree
- B. Disagree
- C. Abstain

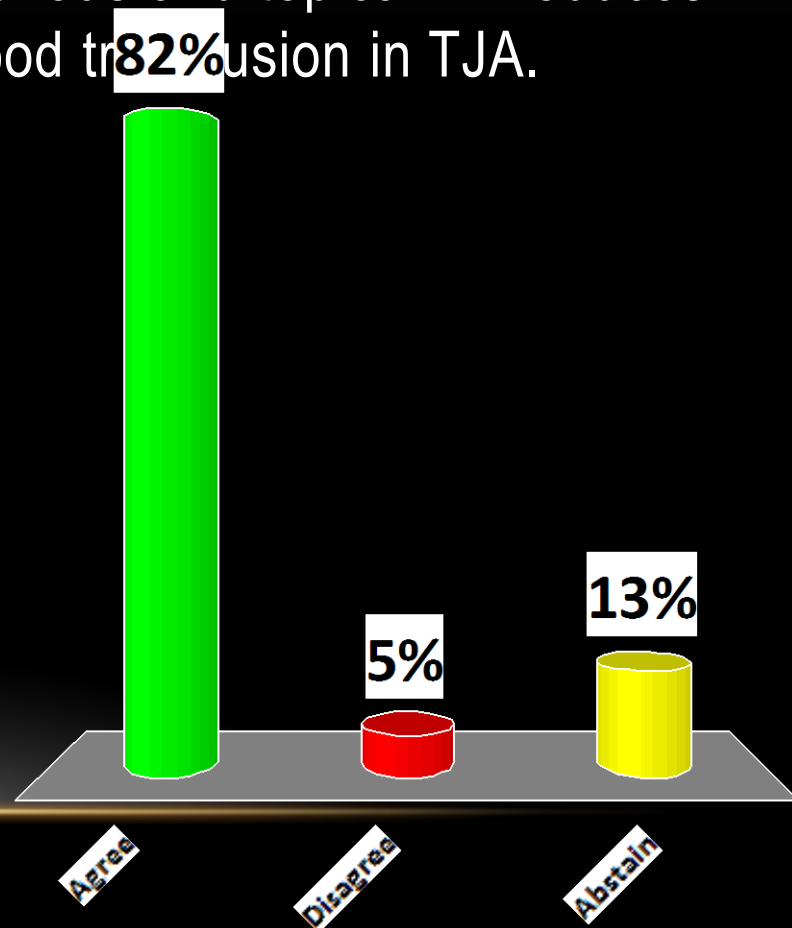


WG V

Question 6A: What is the role for tranexamic acid (TA) for minimizing blood loss during surgery for treatment of PJI?

Consensus: Administration of both intravenous and topical TA reduces the amount of blood loss and allogenic blood transfusion in TJA.

- A. Agree
- B. Disagree
- C. Abstain

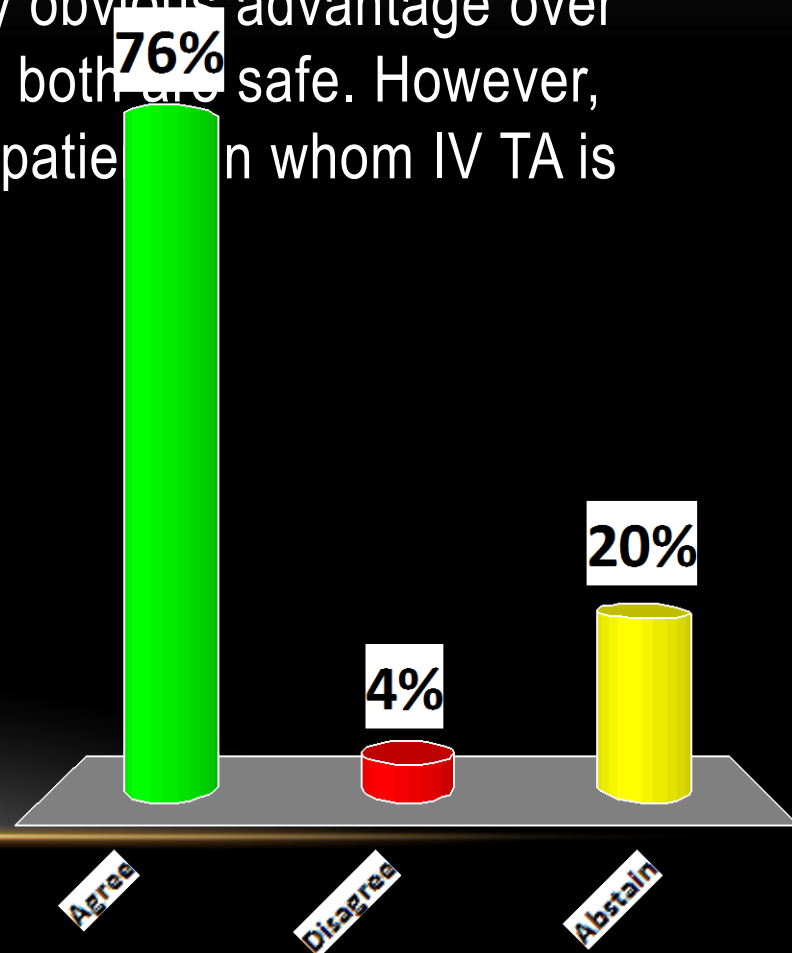


WG V

Question 6B: Does administration of topical TA have an advantage over intravenous administration?

Consensus: Topical TA does not have any obvious advantage over intravenous administration of the drug and both are safe. However, topical TA may be used in certain group of patients in whom IV TA is considered to be inappropriate.

- A. Agree
- B. Disagree
- C. Abstain

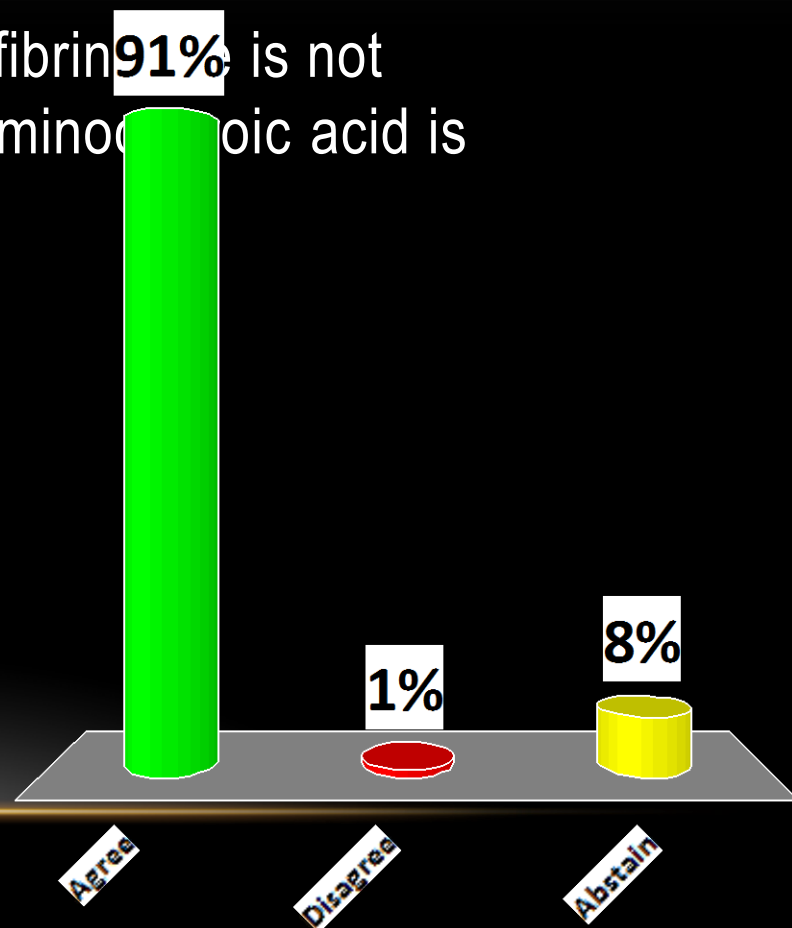


WG V

Question 7: What is the role for other agents such as platelet-rich plasma (PRP), fibrin glue, and aminocaproic acid for minimizing blood loss?

Consensus: The routine use of PRP and fibrin glue is not recommended. The recommendation for aminocaproic acid is inconclusive.

- A. Agree
- B. Disagree
- C. Abstain

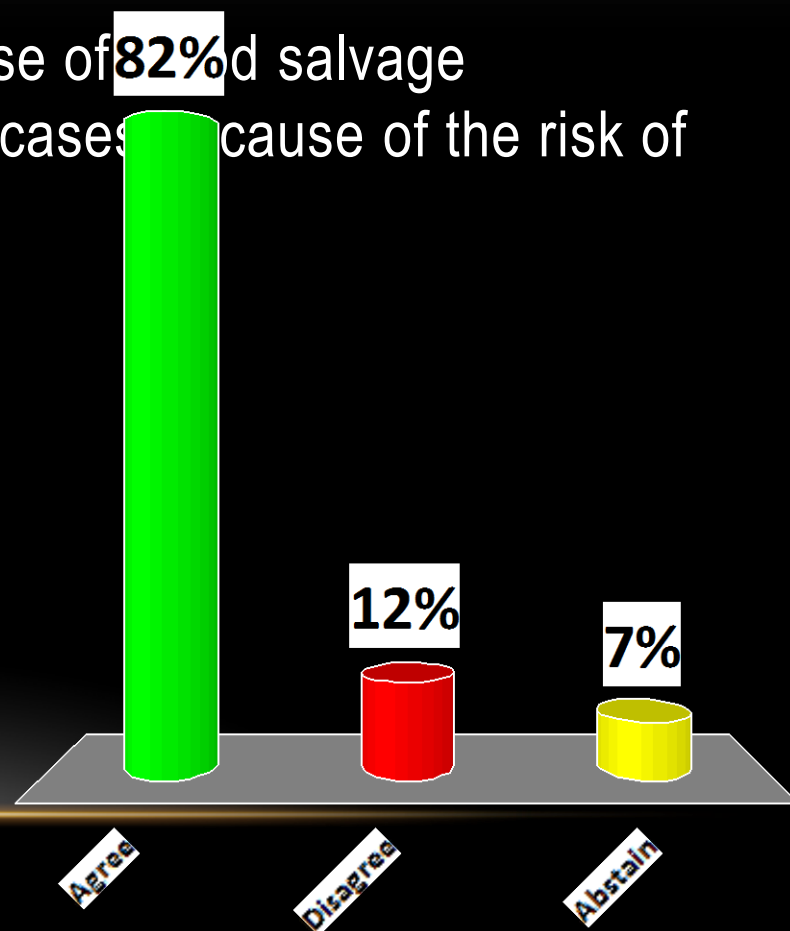


WG V

Question 8: What is the role of blood salvage (intraoperative and postoperative) during the second stage of two-stage exchange arthroplasty for treatment of PJI?

Consensus: We do not recommend the use of blood salvage (intraoperative and postoperative) in PJI cases because of the risk of spreading the infection.

- A. Agree
- B. Disagree
- C. Abstain

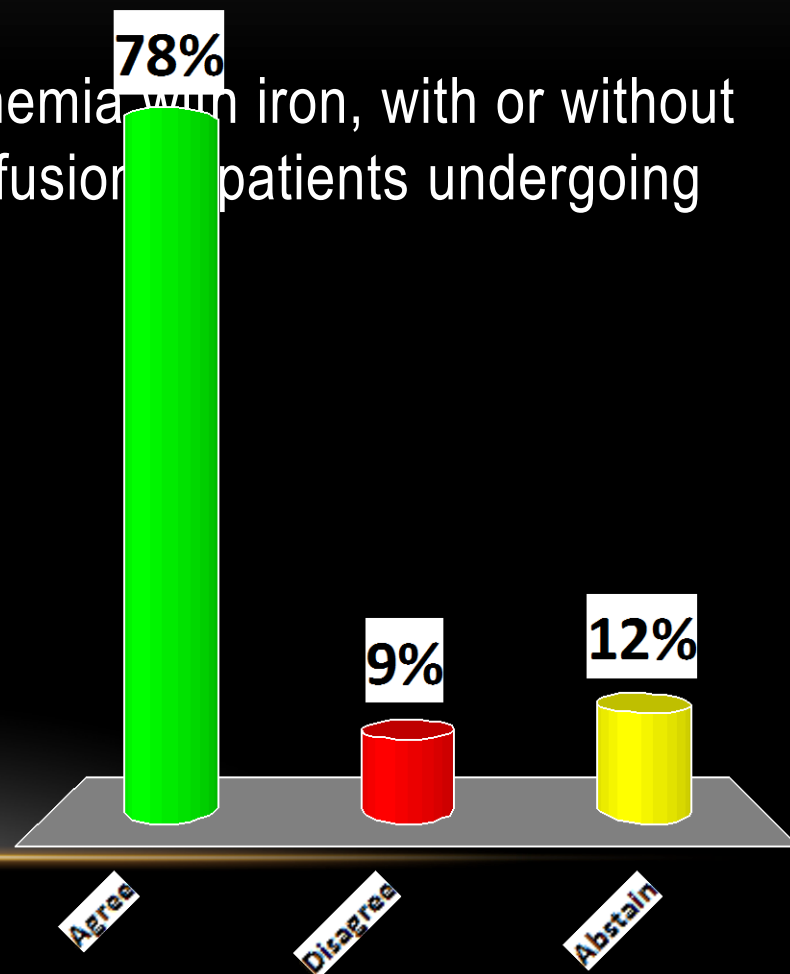


WG V

Question 9: What is the role of administration of erythropoietin, hematinics, or other agents between the two stages of exchange arthroplasty for treatment of PJI?

Consensus: Treatment of preoperative anemia with iron, with or without erythropoietin, will reduce the risk of transfusion in patients undergoing TJA..

- A. Agree
- B. Disagree
- C. Abstain

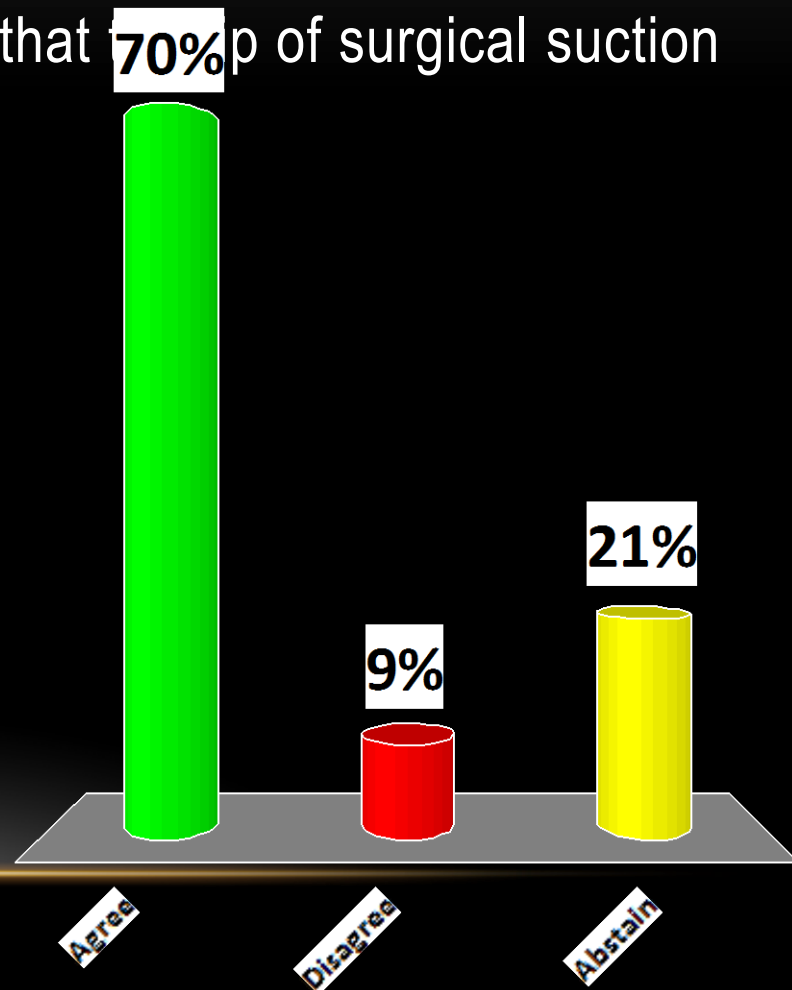


WG V

Question 10: Are self-contained cleaning suction devices (Neptune and others) a source of contamination?

Consensus: There is evidence indicating that 70% of surgical suction drains can be a source of contamination.

- A. Agree
- B. Disagree
- C. Abstain

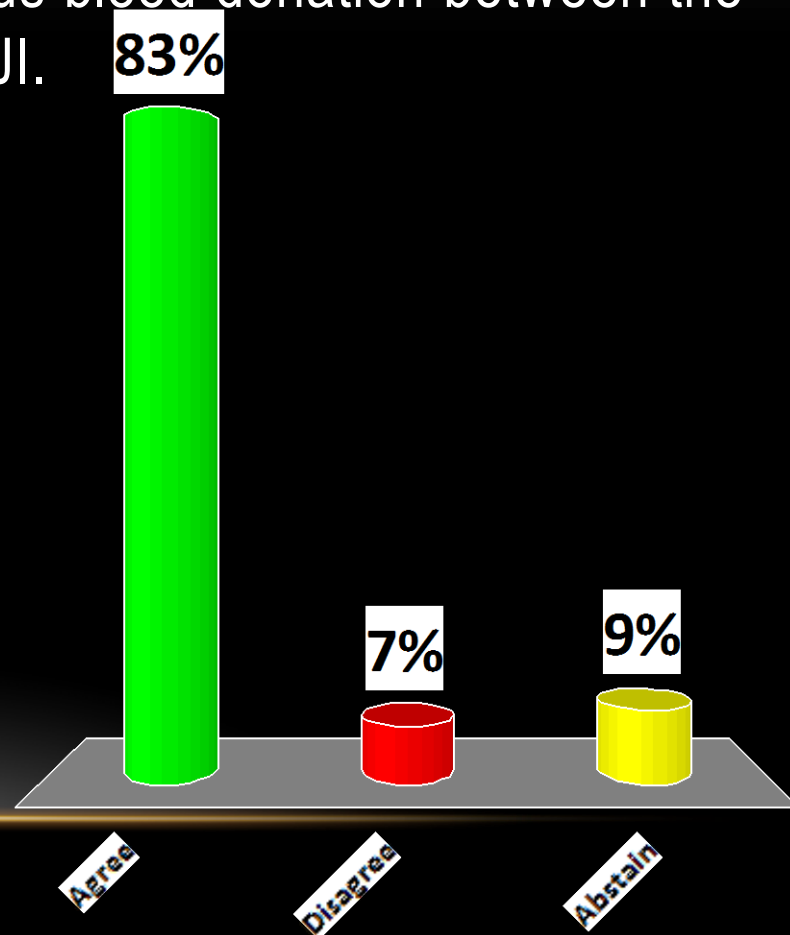


WG V

Question 11: What is the role of preoperative autologous blood donation between the two stages of exchange arthroplasty for PJI?

Consensus: There is no role for autologous blood donation between the two stages of exchange arthroplasty for PJI.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 6: PROSTHESIS SELECTION

Liaison: Claudio Diaz-Ledezma MD

Leaders:

Javad Parvizi MD, FRCS (US), Yixin Zhou MD (International)

Delegates:

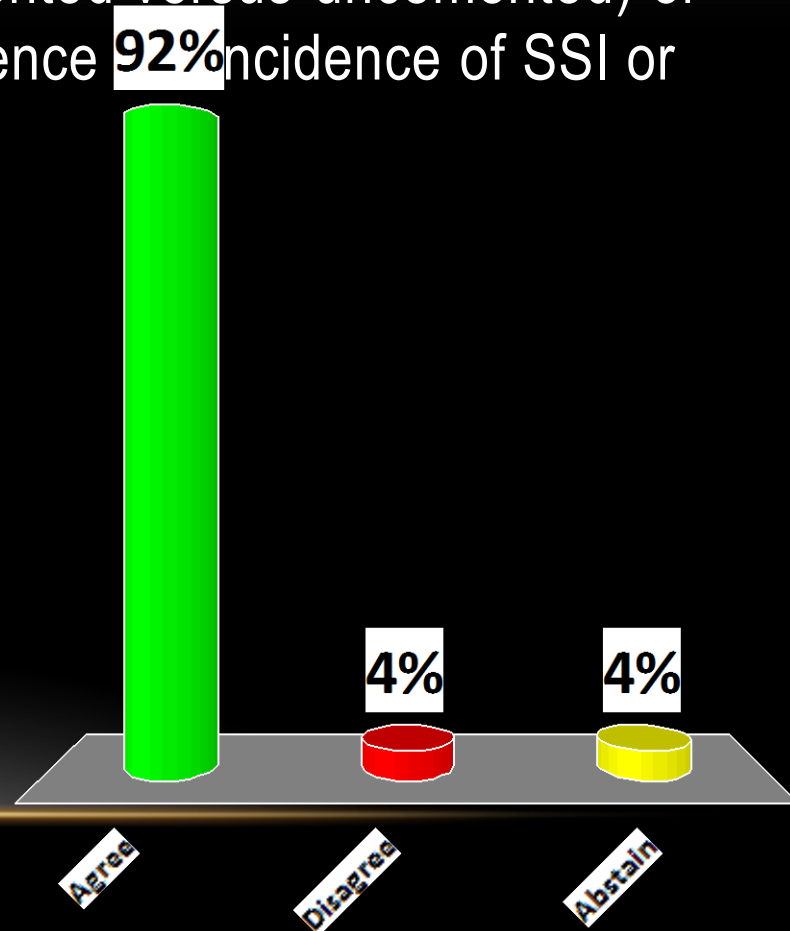
Valentin Antoci MD, Sacha Bittelman MD, Andrew Freiberg MD, Gustavo Garcia MD, Seung Beom Han MD, Noreen Hikock PhD, Carlos Higuera MD, Constantinos Ketonis MD, Feza Korkusuz MD, Jacek Kruczynski MD, Francisco Macule MD, Oliver Marín-Peña MD, Dinesh Nathwani MD, Phillip Noble PhD, Kevin Ong PhD, Nelson Ono MD, Zachary Post MD, Salvador Rivero-Boschert MD, Thomas Schaer PhD, Irving Shapiro DDS, PhD

WG VI

Question 1: Does the type of prosthesis influence the incidence of surgical site infection (SSI) or periprosthetic joint infection (PJI)?

Consensus: The type of prosthesis (cemented versus uncemented) or coating with hydroxyapatite does not influence incidence of SSI or PJI.

- A. Agree
- B. Disagree
- C. Abstain

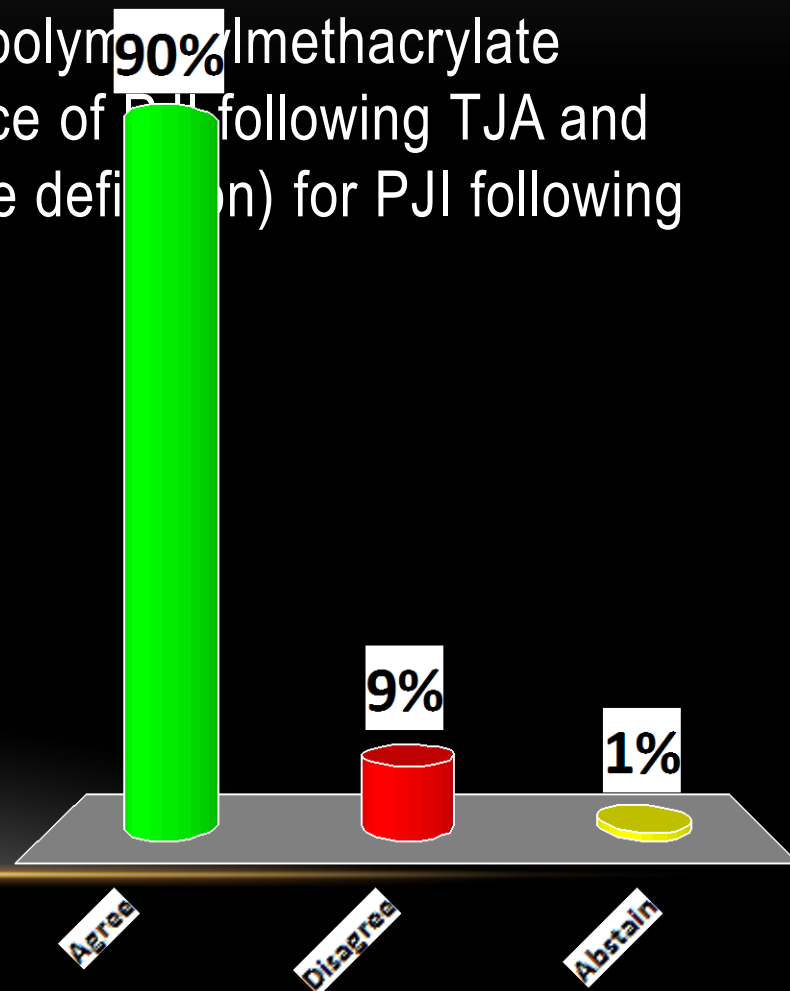


WG VI

Question 2A: Does antibiotic-impregnated cement reduce the incidence of PJI following elective total joint arthroplasty (TJA)?

Consensus: Yes. Antibiotic-impregnated polymethylmethacrylate cement (ABX-PMMA) reduces the incidence of PJI following TJA and should be used in patients at high risk (see definition) for PJI following elective arthroplasty.

- A. Agree
- B. Disagree
- C. Abstain

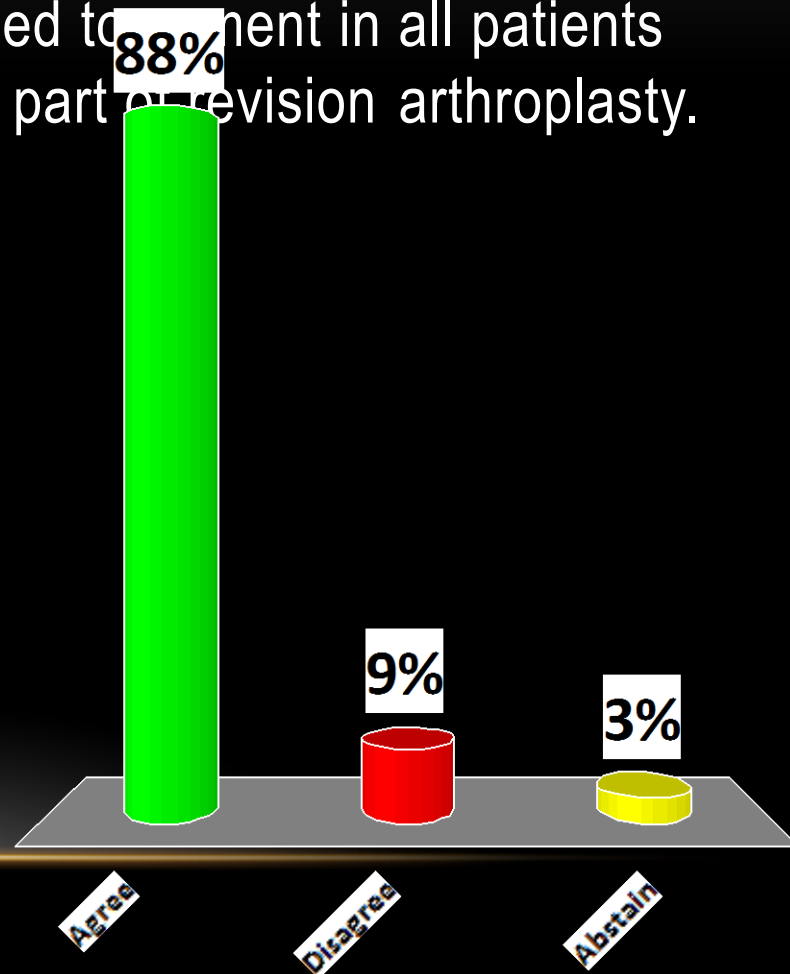


WG VI

Question 2B: Does antibiotic-impregnated cement reduce the incidence of PJI following elective total joint arthroplasty (TJA)?

Consensus: Yes. Antibiotic should be added to cement in all patients undergoing cemented or hybrid fixation as part of revision arthroplasty.

- A. Agree
- B. Disagree
- C. Abstain

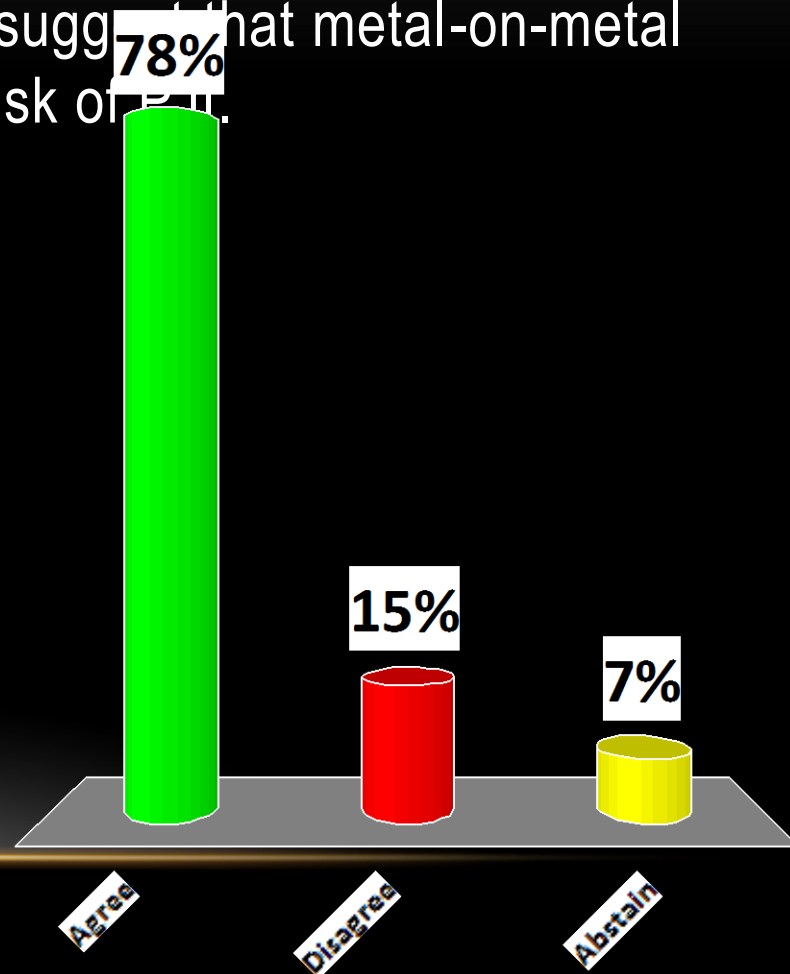


WG VI

Question 3: Does the type of bearing surface in THA influence the incidence of SSI/PJI?

Consensus: Data from Medicare registry suggest that metal-on-metal bearing may be associated with a higher risk of PJI.

- A. Agree
- B. Disagree
- C. Abstain

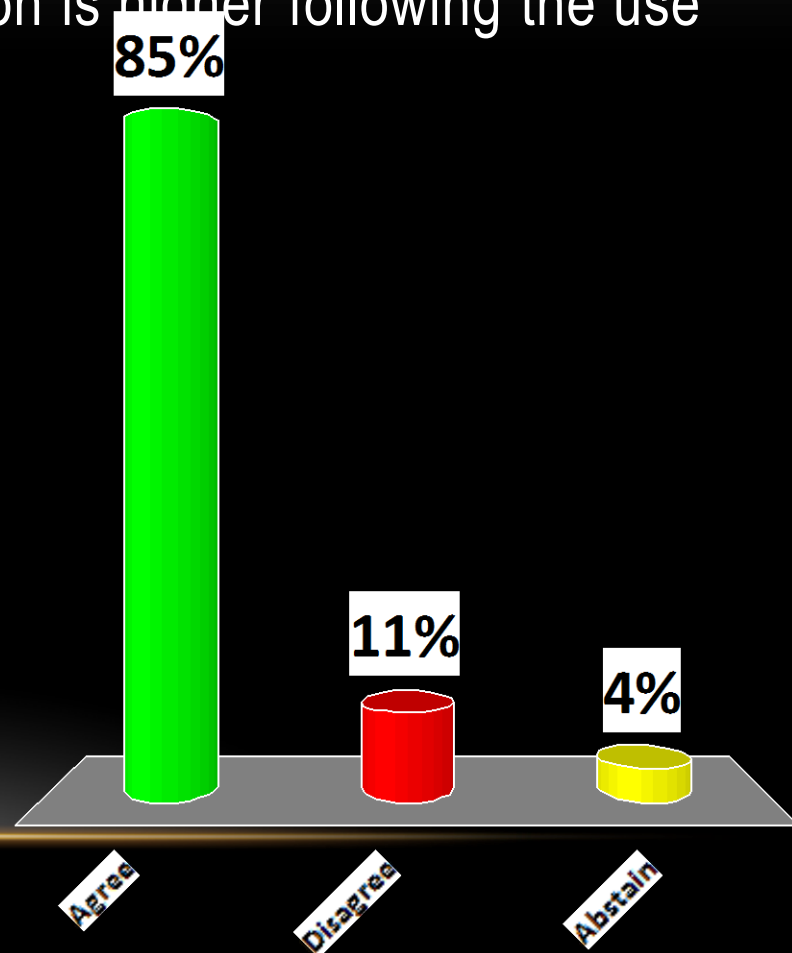


WG VI

Question 4: Does the size of prosthesis (volume of foreign material) influence the incidence of SSI following TJA?

Consensus: Yes. The incidence of infection is higher following the use of megaprotheses.

- A. Agree
- B. Disagree
- C. Abstain

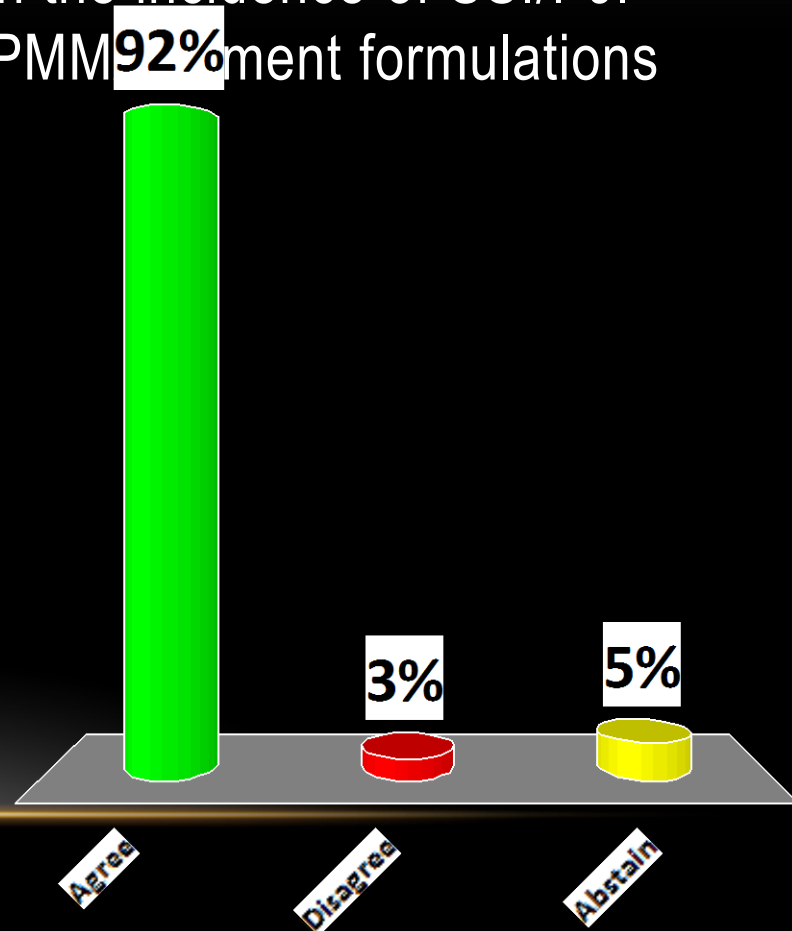


WG VI

Question 5: Is there a difference between various types of cement with regard to the incidence of SSI after TJA?

Consensus: There is no clear difference in the incidence of SSI/PJI following joint arthroplasty when different PMMA cement formulations are used.

- A. Agree
- B. Disagree
- C. Abstain

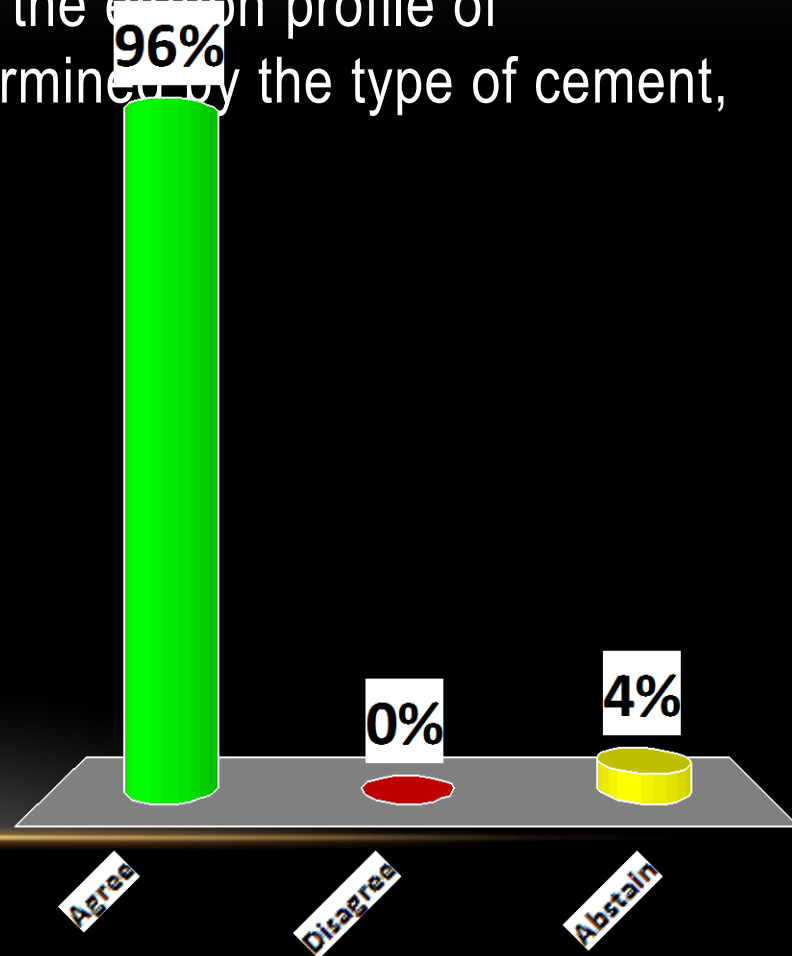


WG VI

Question 6: Is there a difference between various types of cement with regard to antibiotic elution?

Consensus: There is a clear difference in the elution profile of antibiotics from PMMA cement that is determined by the type of cement, type, and dose of antibiotic.

- A. Agree
- B. Disagree
- C. Abstain

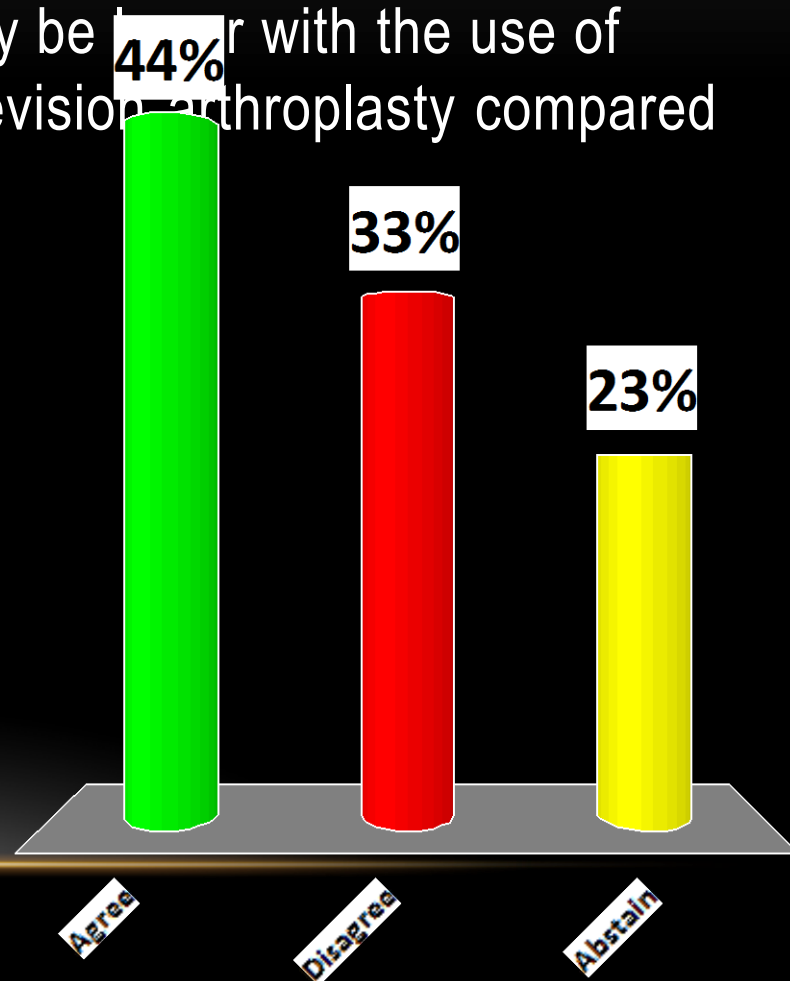


WG VI

Question 7: Is there a difference in the incidence of SSI after the use of different uncemented prostheses?

Consensus: The incidence of SSI/PJI may be lower with the use of porous metal (tantalum) implants during revision arthroplasty compared to titanium.

- A. Agree
- B. Disagree
- C. Abstain

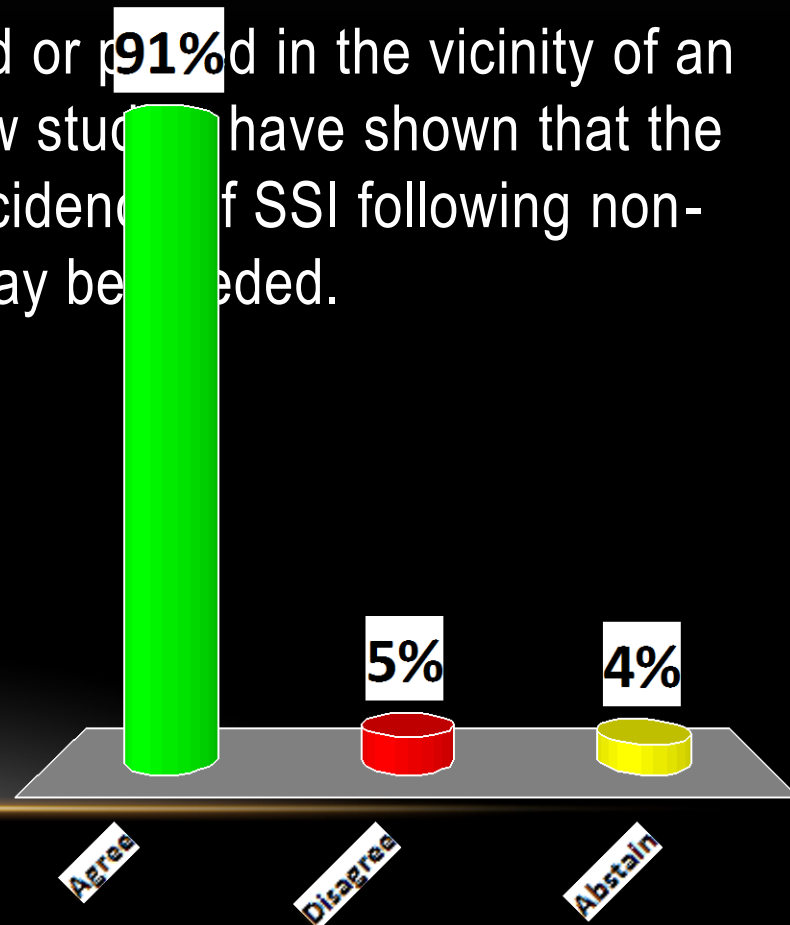


WG VI

Question 8: Is there a role for the use of antibiotic powder (such as vancomycin) in the wound during TJA?

Consensus: There is no literature to suggest that the use of vancomycin powder poured into the wound or placed in the vicinity of an implant reduces the incidence of PJI. A few studies have shown that the use of vancomycin powder reduces the incidence of SSI following non-arthroplasty procedures. Future studies may be needed.

- A. Agree
- B. Disagree
- C. Abstain

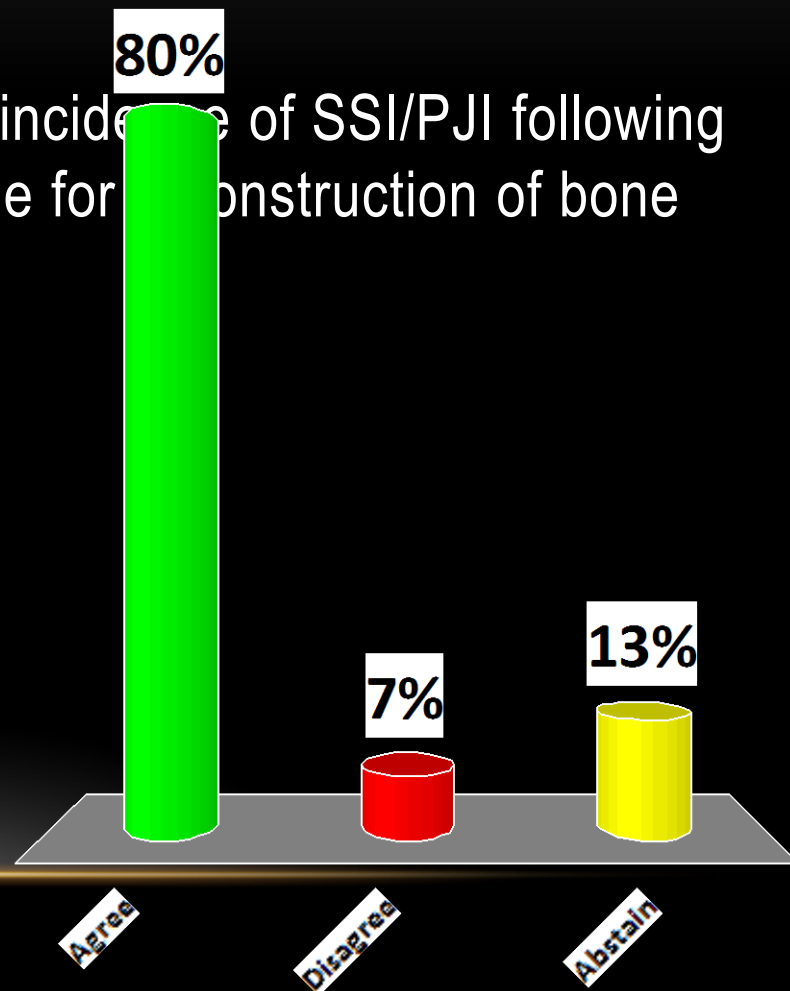


WG VI

Question 9: Is there a difference in the incidence of SSI/PJI with the use of metal augments compared to allograft to reconstruct bone deficiency in the setting of infection?

Consensus: There is no difference in the incidence of SSI/PJI following the use of metal augments or allograft bone for reconstruction of bone defects.

- A. Agree
- B. Disagree
- C. Abstain

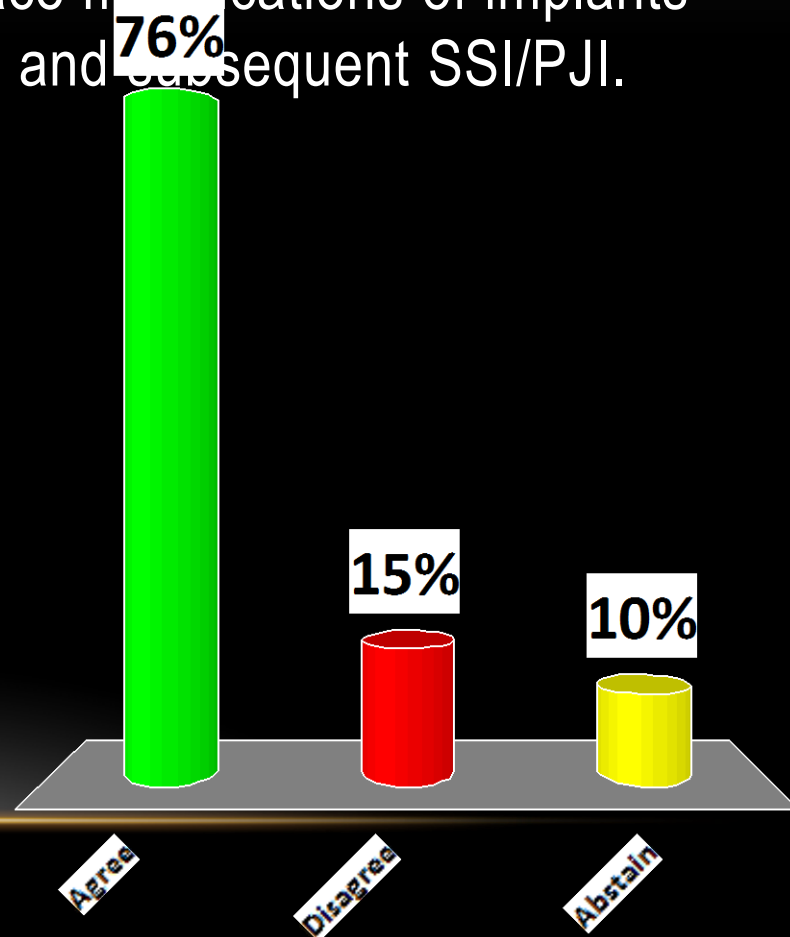


WG VI

Question 10: Is there a role for modification of the prosthesis surface that may minimize PJI?

Consensus: There is a real need for surface modifications of implants that can help reduce bacterial colonization and subsequent SSI/PJI.

- A. Agree
- B. Disagree
- C. Abstain

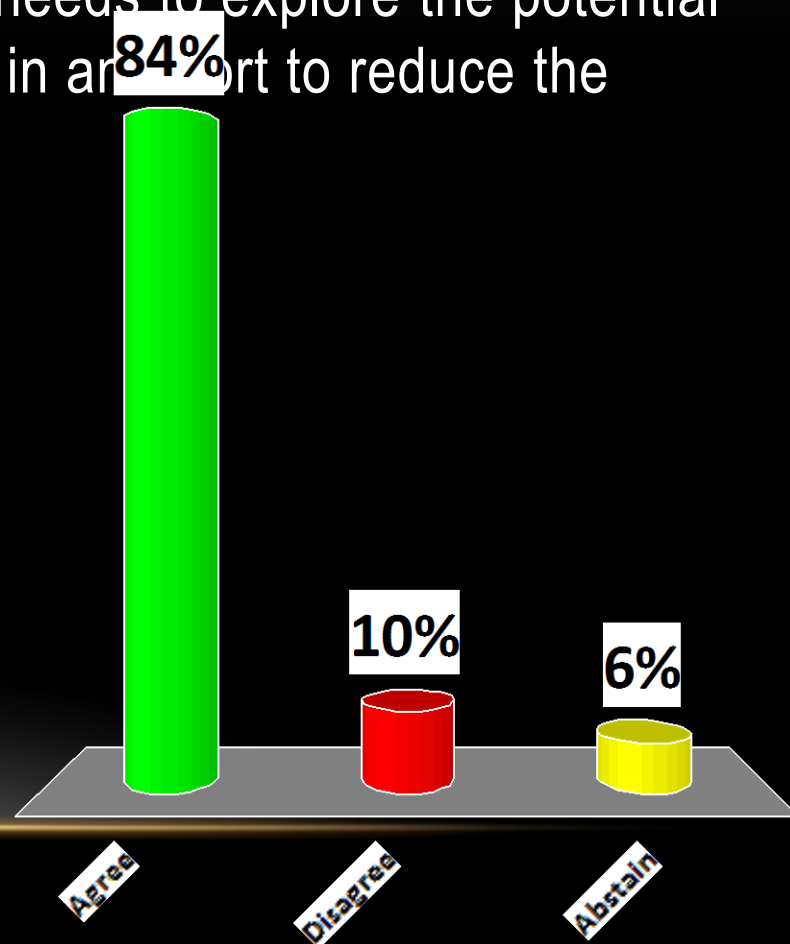


WG VI

Question 11: Are there any novel developments for the prevention of SSI/PJI?

Consensus: The orthopaedic community needs to explore the potential for surface modifications of the prosthesis in an effort to reduce the incidence of SSI/PJI.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 7: DIAGNOSIS

Liaison: Benjamin Zmistowski BS

Leaders:

Drago Lorenzo MD (International), Craig Della Valle (US)

Delegates:

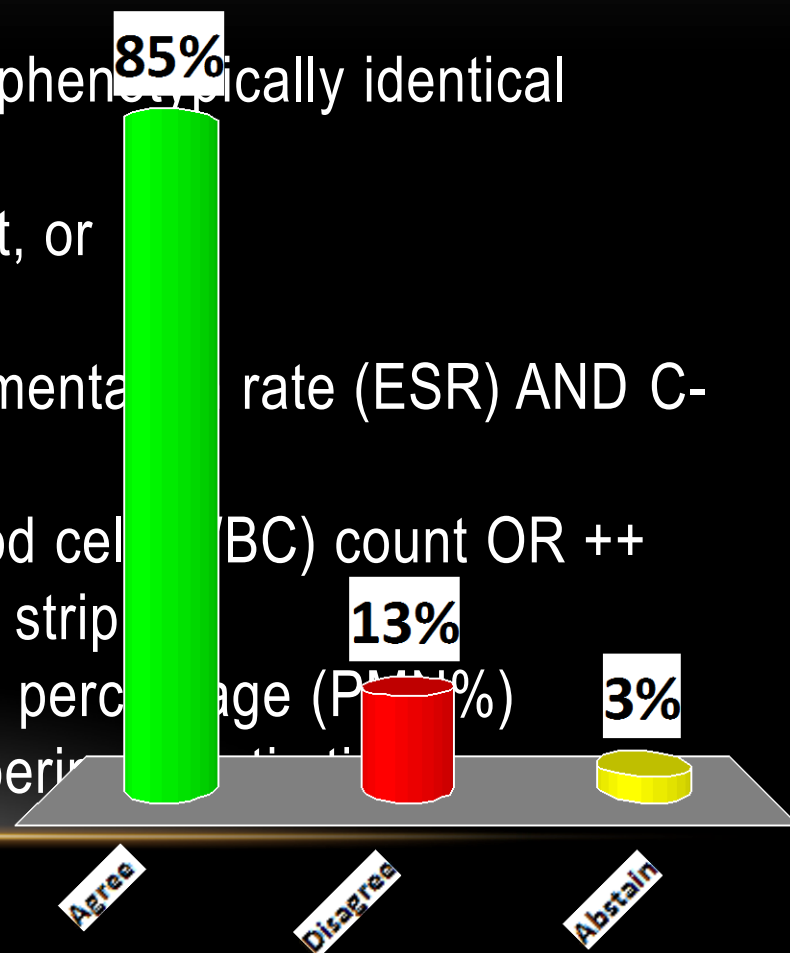
Abbas Alavi MD, Hani Bedair MD, Robert E Booth MD, Peter Choong MD, Carl Deirmengian MD, Paul E DiCesare MD, Garth D Ehrlic PhD, A Gambir MD, Ron Huang MD, Yair Kissin MD, Naomi Kobayashi MD, Veit Krenn MD, Drago Lorenzo MD, SB Marston MD, G Meermans MD, Javier Perez MD, JJ Ploegmakers MD, Matthew Ramsey MD, Aaron Rosenberg MD, C Simpendorfer MD, John Sperling MD, Peter Thomas MD, Stephan Tohtz MD, Jorge A Villafuerte MD, Peter Wahl MD, Frank-Christiaan Wagenaar MD, Eivind Witso MD

WG VII

Question 1A: What is the definition of periprosthetic joint infection (PJI)?

CONSENSUS: PJI is defined as:

- Two positive periprosthetic cultures with phenotypically identical organisms, or
- A sinus tract communicating with the joint, or
- Having 3 of the following minor criteria:
 - Elevated serum erythrocyte sedimentation rate (ESR) AND C-reactive protein (CRP)
 - Elevated synovial fluid white blood cell (WBC) count OR ++ change on leukocyte esterase test strip
 - Elevated synovial fluid neutrophil percentage (PMN%)
 - Positive histological analysis of periprosthetic tissue
 - A single positive culture

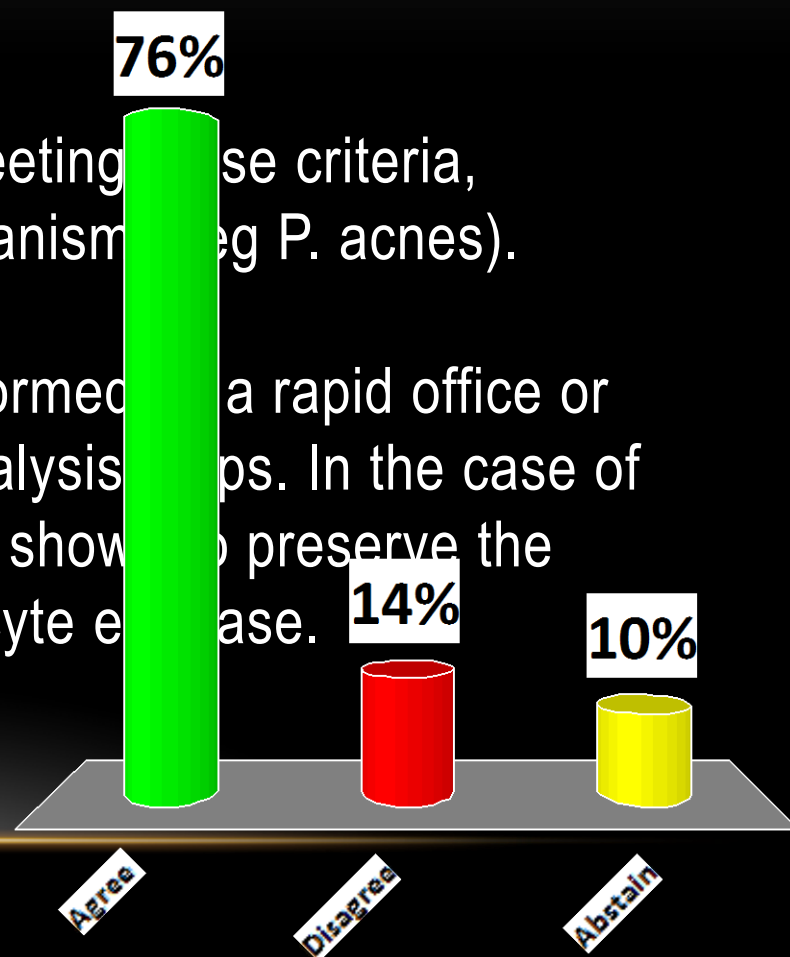


WG VII

Question 1B: What are some considerations for the definition of periprosthetic joint infection (PJI)?

Consensus:

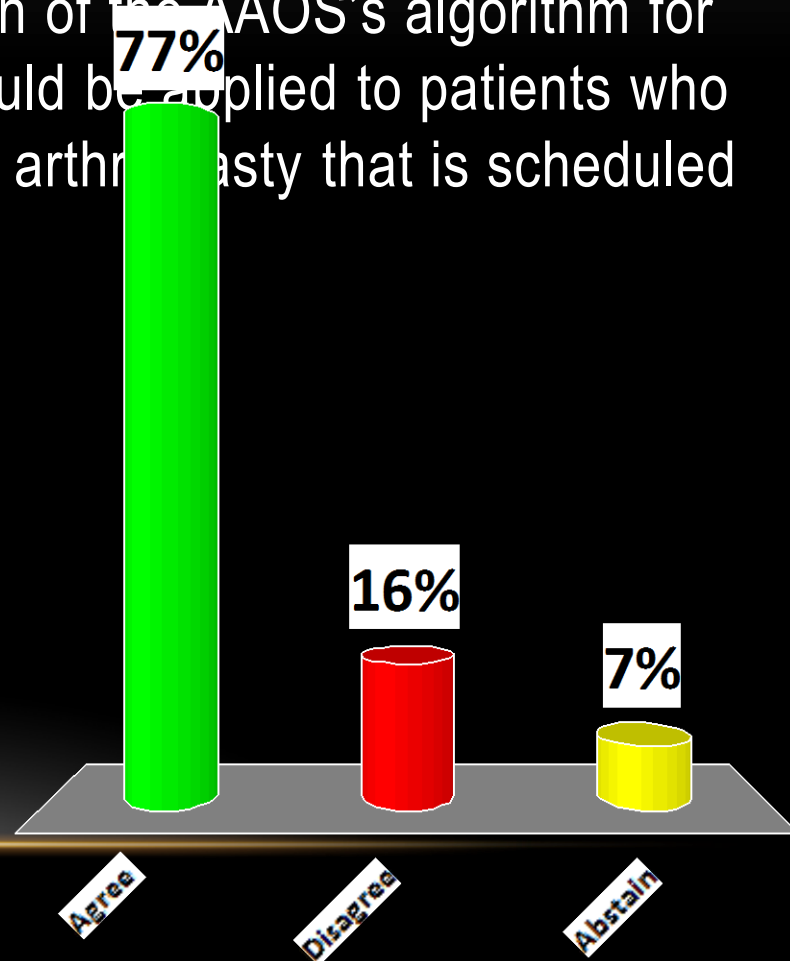
- Clinically, PJI may be present without meeting these criteria, specifically in the case of less virulent organisms (e.g. *P. acnes*).
- Synovial leukocyte esterase can be performed as a rapid office or intraoperative point of care test using urinalysis strips. In the case of bloody aspiration, centrifugation has been shown to preserve the accuracy of the colorimetric test for leukocyte esterase.



WG VII

Question 2: Do you agree with the American Academy of Orthopaedic Surgeons's (AAOS) algorithm for diagnosis of PJI?

Consensus: The following is an adaptation of the AAOS's algorithm for the diagnosis of PJI.³⁸ This algorithm should be applied to patients who present with a painful or failed hip or knee arthroplasty that is scheduled for revision.



WG VII

Major Criteria:

- Sinus tract communicating with the joint

Minor Criteria:

- Culture
- Leukocyte Esterase
- Synovial White Blood Cell Count
- Synovial Neutrophil Percentage

Normal ESR and CRP
AND
Low Probability of Infection
(based on history/PE/X-ray)

History
Physical Examination (PE)
X-Ray (Joint Specific)
Serology (ESR and CRP)

Presence of Major Criteria

Abnormal ESR and/or CRP
OR
Higher Probability of Infection
(based on history/PE/X-ray)
without major criteria

78%

Culture Positive and One
Other Minor Criterion Positive
OR
Two Positive Minor Criteria

All minor criteria negative

Joint Aspiration

Minor Criteria Positive

No Fluid
OR

Culture Positive Without One
Positive Minor Criterion

OR

One or Two Positive Minor Criteria

OR

Clinical Suspicion Persists with
Positive Minor Criteria

All minor criteria negative

Repeat Aspiration
With Addition of AFB/
Fungal Cultures

Culture
OR

Minor criteria Positive

No Fluid
OR

Culture negative and only one
minor criteria positive

15%

7%

Biopsy
(Micro AND Histology)

Agree

Disagree

Abstain

Infection Unlikely

Negative

Positive

Infection Likely

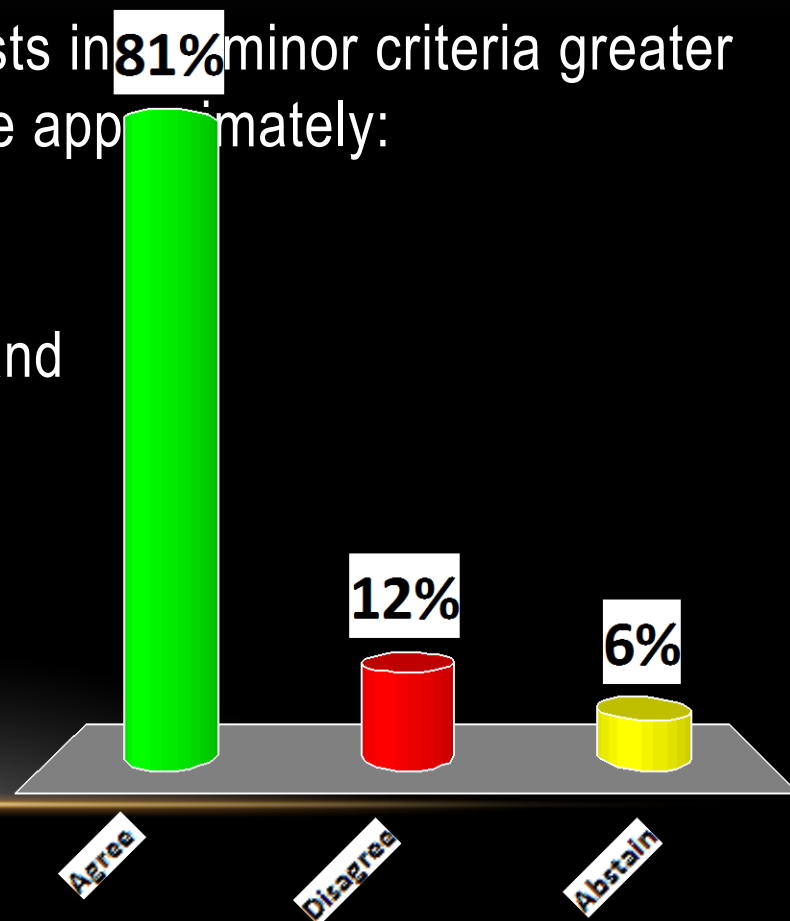
WG VII

Question 3A: What should the threshold be for ESR, serum CRP, PMN%, and WBC count for PJI for ACUTE cases?

Consensus:

The cutoffs to be used for the following tests in **81%** minor criteria greater than 6 weeks from most recent surgery are approximately:

- CRP > 100 mg/L (knee and hip),
- Synovial WBC count > 10,000 cells/ μ L, and
- Synovial PMN% > 90%.



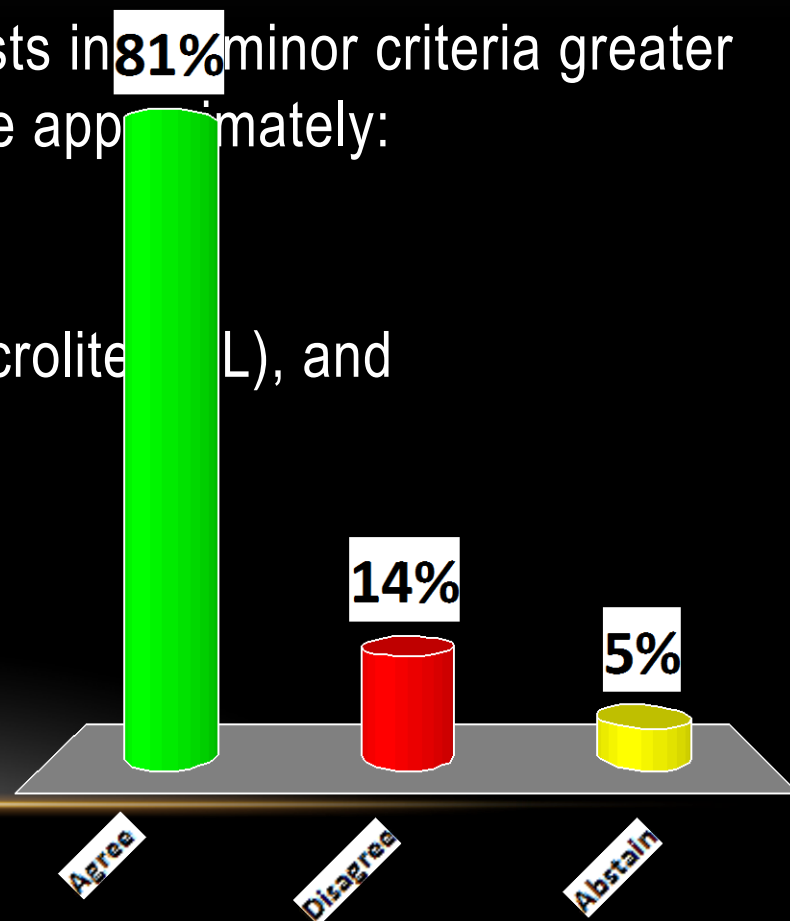
WG VII

Question 3B: What should the threshold be for ESR, serum CRP, PMN%, and WBC count for PJI for CHRONIC cases?

Consensus:

The cutoffs to be used for the following tests in **81%** minor criteria greater than 6 weeks from most recent surgery are approximately:

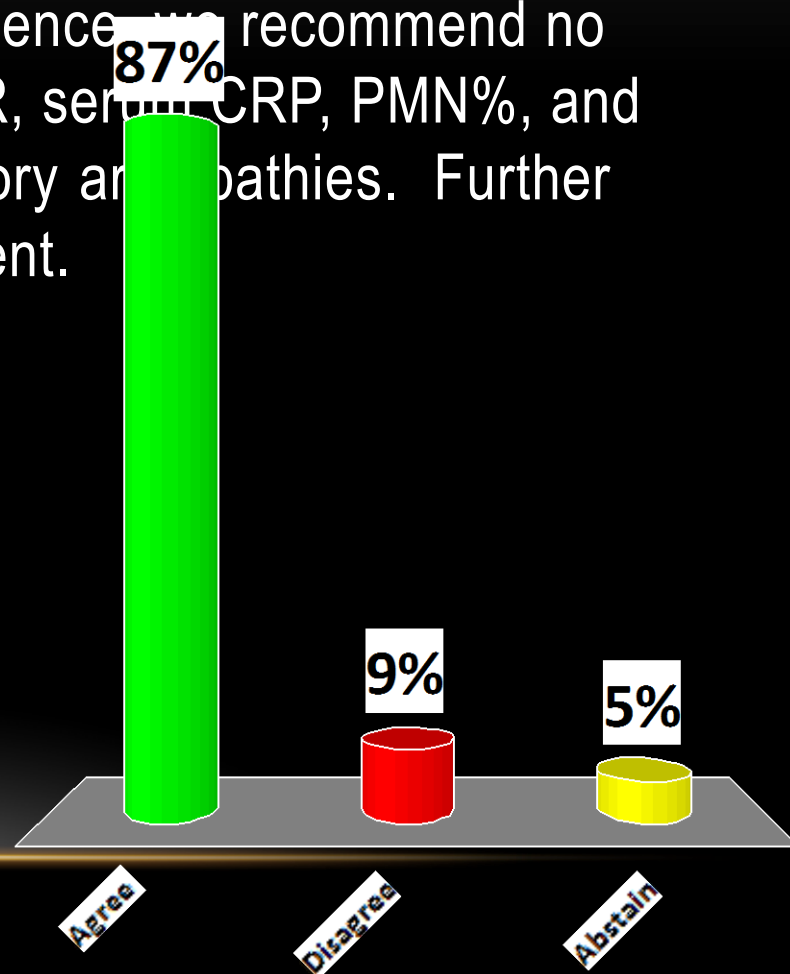
- ESR > 30 millimeters (mm) per hour (hr),
- CRP > 10 milligram (mg) per liter (L),
- Synovial WBC count > 3,000 cells per microliter (L), and
- Synovial PMN% > 80%.



WG VII

Question 3C: What should the threshold be for ESR, serum CRP, PMN%, and WBC count for PJI in inflammatory arthropathies?

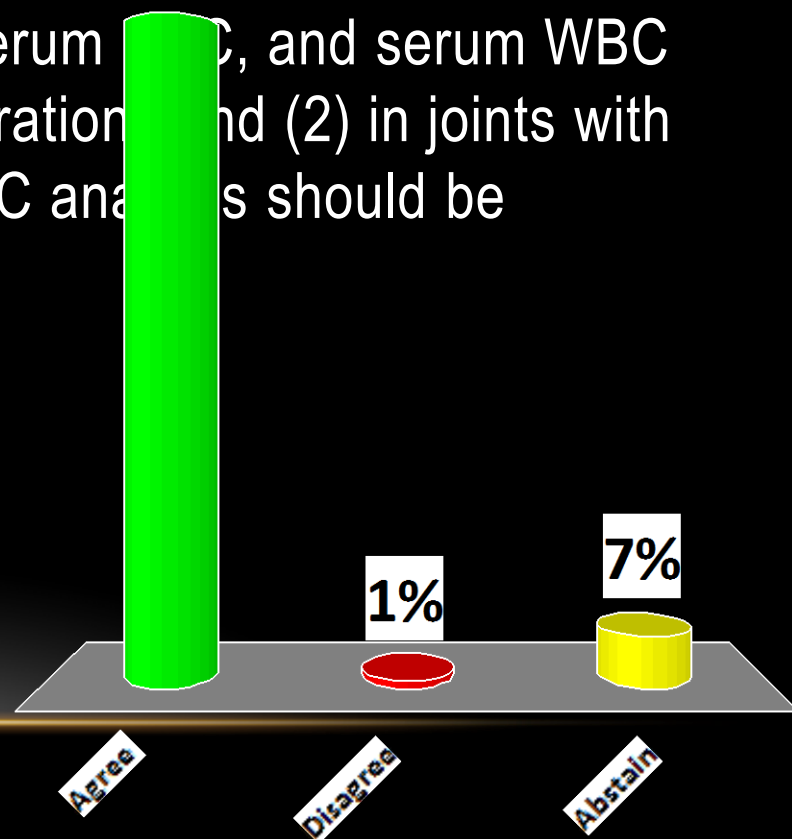
Consensus: Based upon very limited evidence, we recommend no change from the above thresholds for ESR, serum CRP, PMN%, and WBC count for PJI diagnosis in inflammatory arthropathies. Further research is needed to confirm this statement.



WG VII

Question 4: In analyzing synovial fluid cell count, what are important techniques to minimize variation:

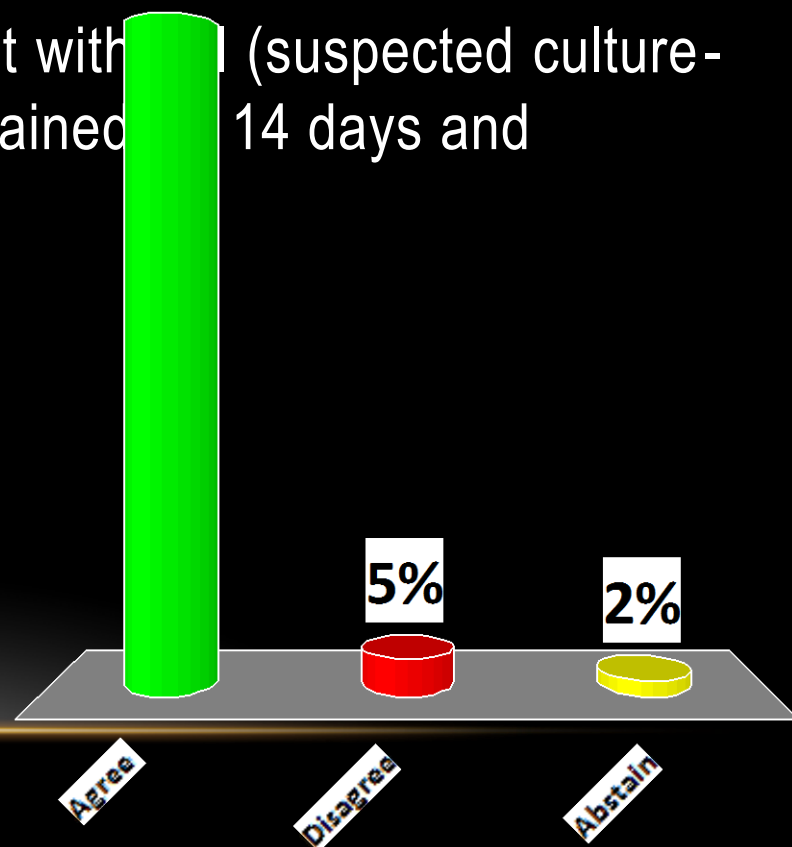
Consensus: To accurately analyze synovial fluid cell count we recommend that (1) synovial fluid WBC count results be transformed using the synovial red blood cell (RBC), serum RBC, and serum WBC concentrations to adjust for traumatic aspiration and (2) in joints with metal-on-metal components a manual WBC analysis should be performed.



WG VII

Question 5: How long should routine cultures be kept?

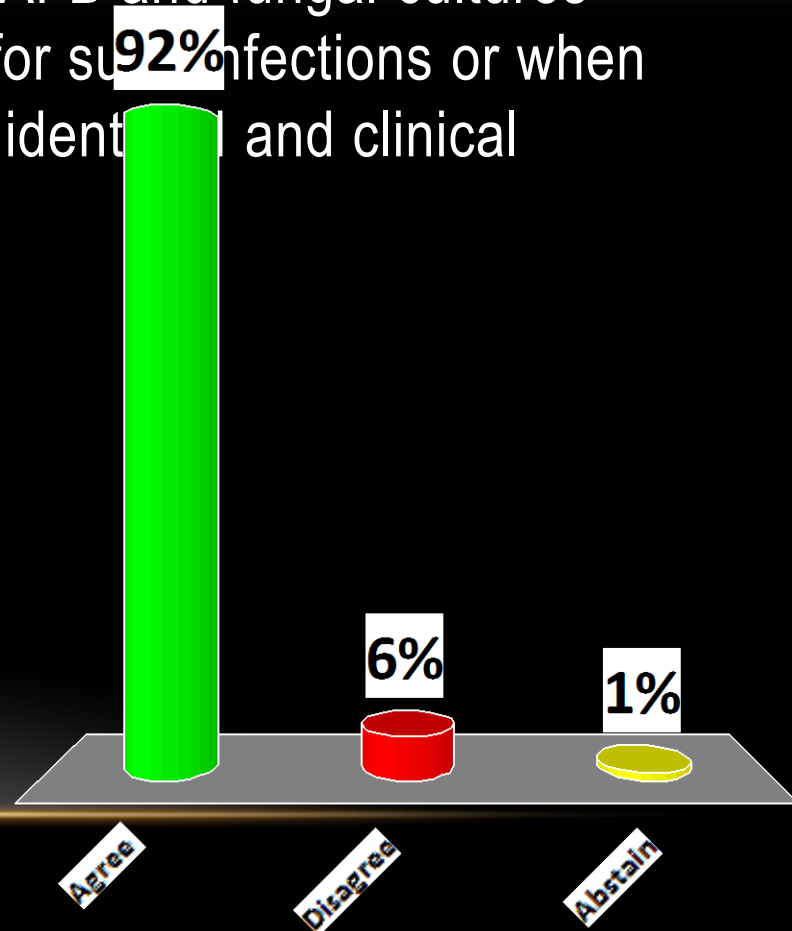
Consensus: We recommend routine cultures should be maintained between 5 and 14 days. In cases of suspected PJI with low virulence organisms or if preoperative cultures have failed **93%** show bacterial growth and the clinical picture is consistent with PJI (suspected culture-negative PJI) the cultures should be maintained 14 days and possibly longer.



WG VII

Question 6A: Is there a role for routine acid-fast bacillus (AFB) and fungal testing in suspected PJI?

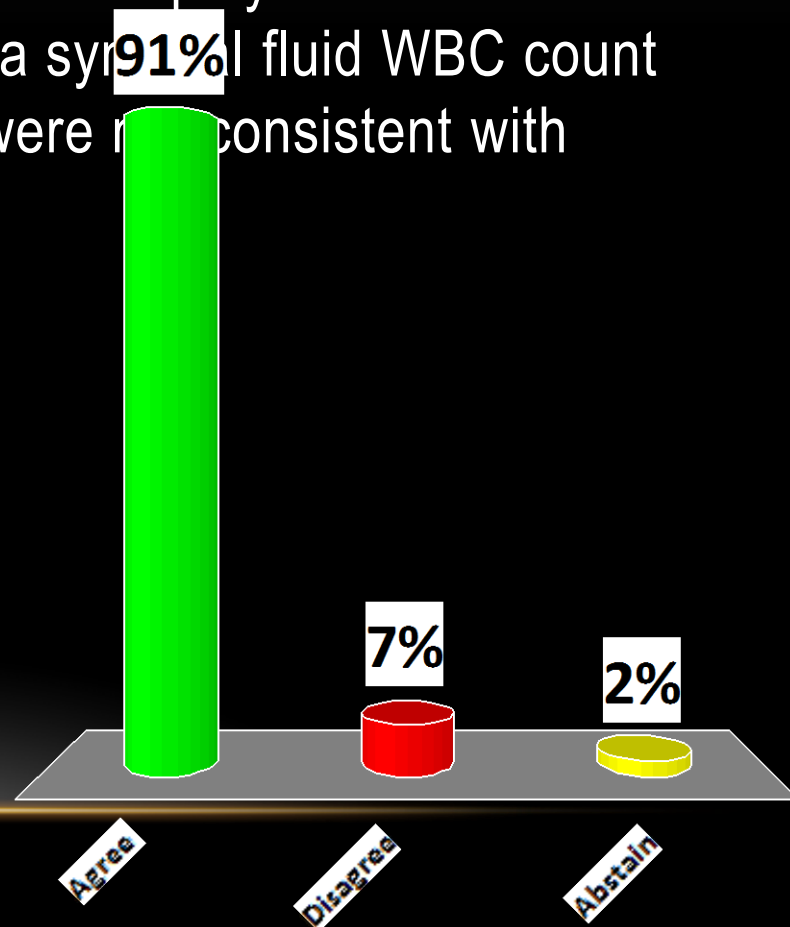
Consensus: In proven or suspected PJI, AFB and fungal cultures should be limited to those patients at risk for soft tissue infections or when other traditional pathogens have not been identified and clinical suspicion persists.



WG VII

Question 6B: Is there a role for routine acid-fast bacillus (AFB) and fungal testing in suspected aseptic failure?

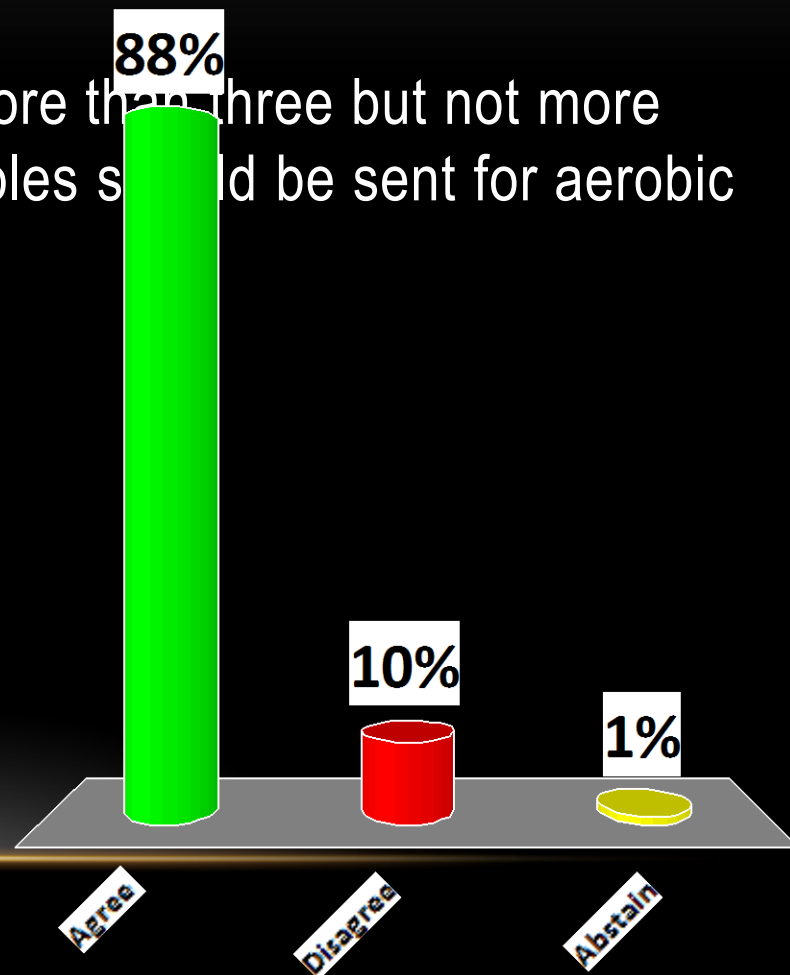
Consensus: No. AFB and fungal cultures do not play a role in presumed aseptic cases (eg cases where a synovial fluid WBC count and differential performed preoperatively were not consistent with infection).



WG VII

Question 7A: How many intraoperative tissue samples should be sent for culture in suspected PJI cases and cases of suspected aseptic failure?

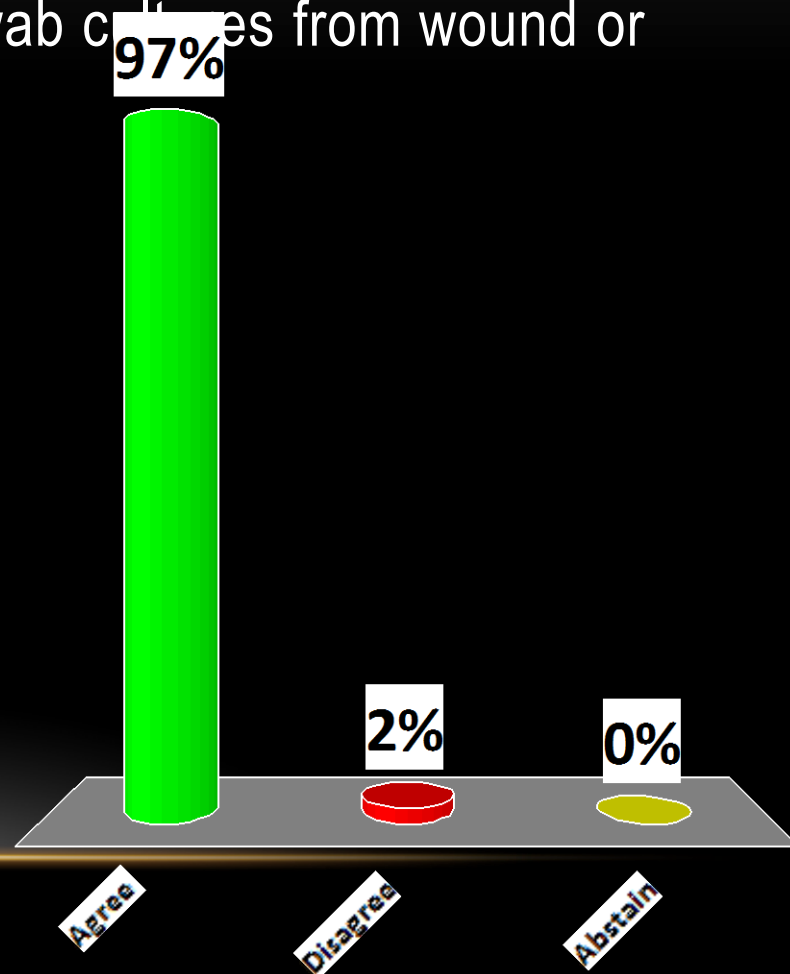
Consensus: In all revision procedures, more than three but not more than six distinct intraoperative tissue samples should be sent for aerobic and anaerobic culture.



WG VII

Question 7B: How should culture samples be obtained?

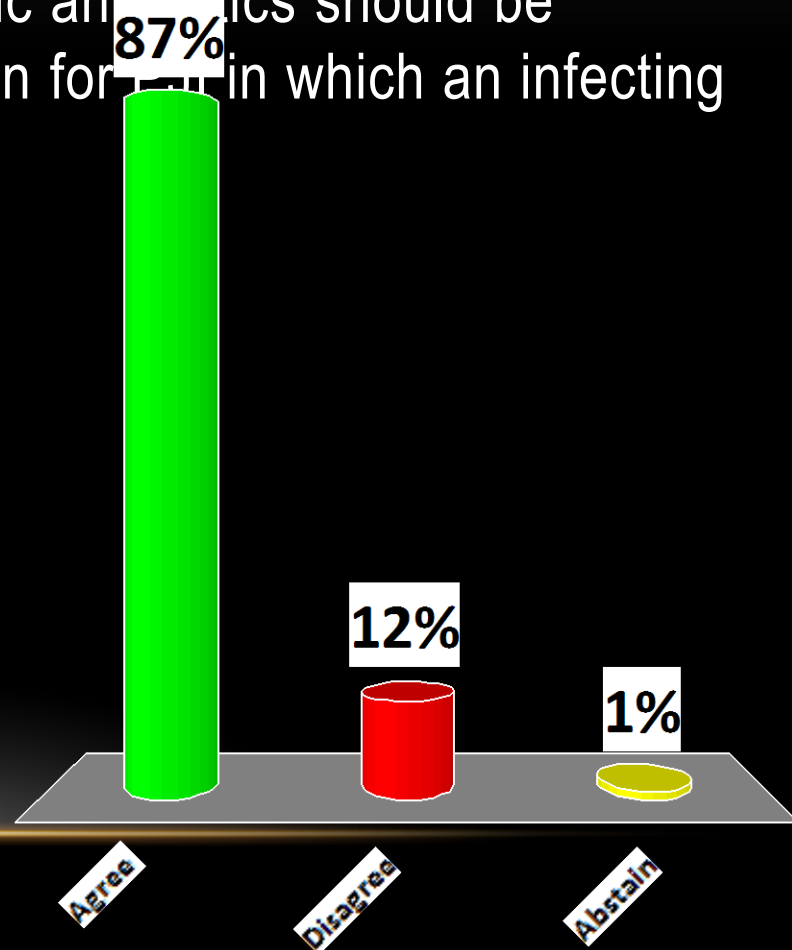
Consensus: Tissue or fluid samples from representative area should be taken. We strongly recommend against swab cultures from wound or periarticular tissues.



WG VII

Question 7C: Should antibiotic be withheld prior to obtaining samples for culture in all cases?

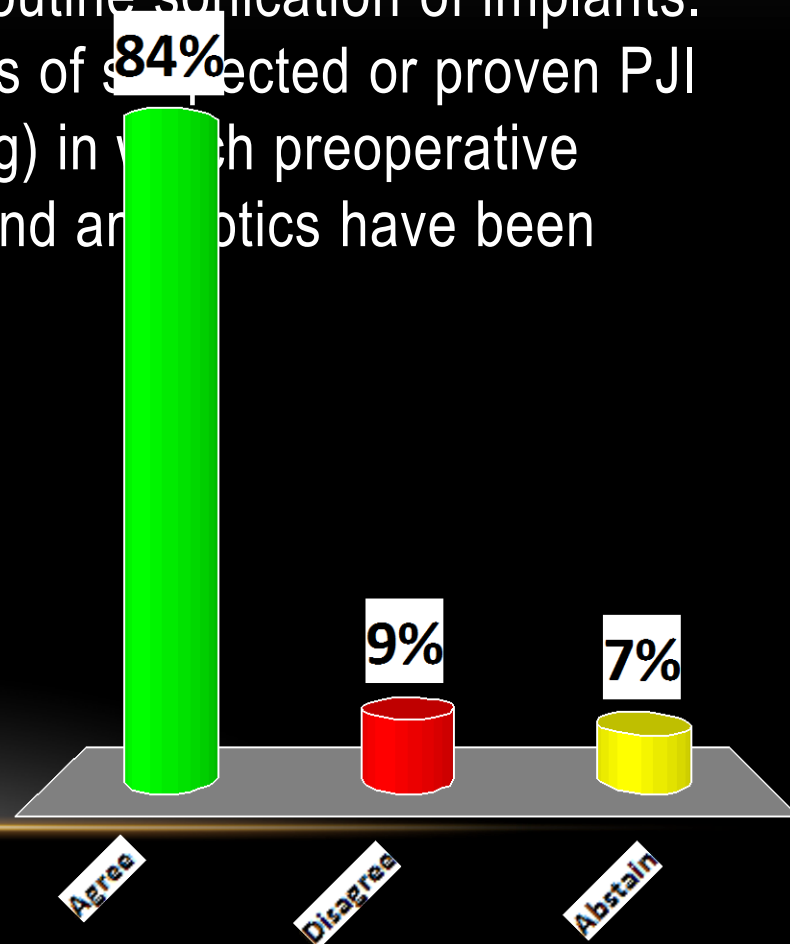
Consensus: No. Perioperative prophylactic antibiotics should be withheld only in cases with a high suspicion for infection in which an infecting organism has not been isolated.



WG VII

**Question 8: Is there a role for routine sonication of the prosthesis?
If so, in which group of patients should this be done?**

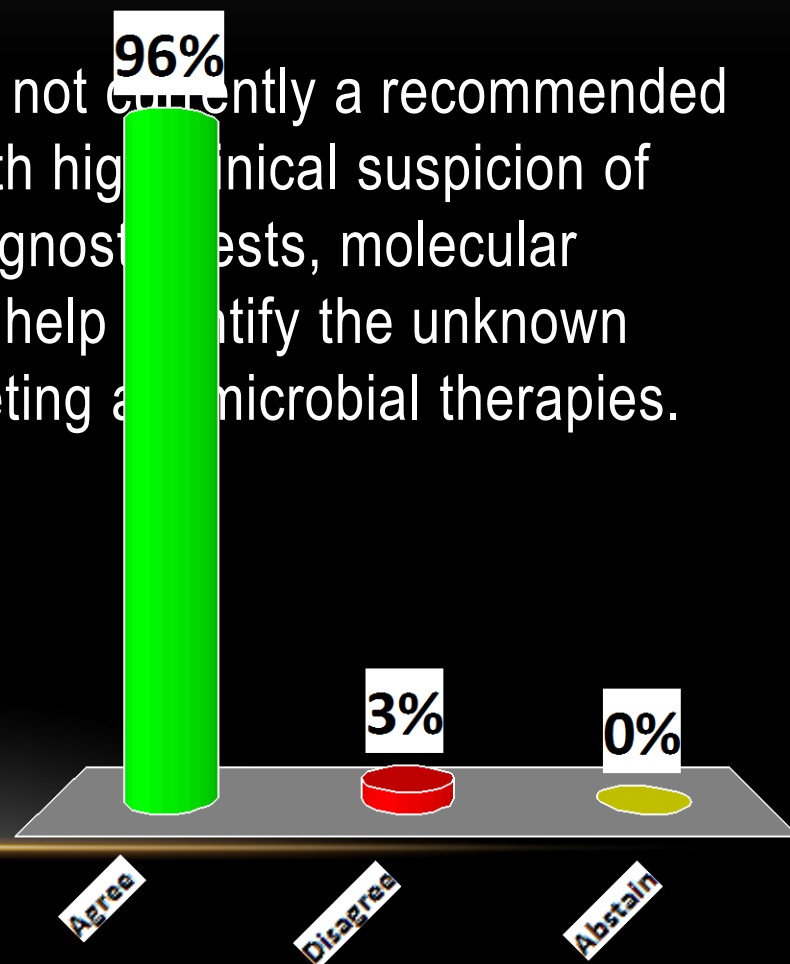
Consensus: No. We do not recommend routine sonication of implants. Its use should be limited to limited to cases of suspected or proven PJI (based upon presentation and other testing) in which preoperative aspiration does not yield positive culture and antibiotics have been administered within the previous 2 weeks.



WG VII

Question 9: Is there a role for molecular techniques such as polymerase chain reaction (PCR) for diagnosis of PJI? If so, in which group of patients should this be done?

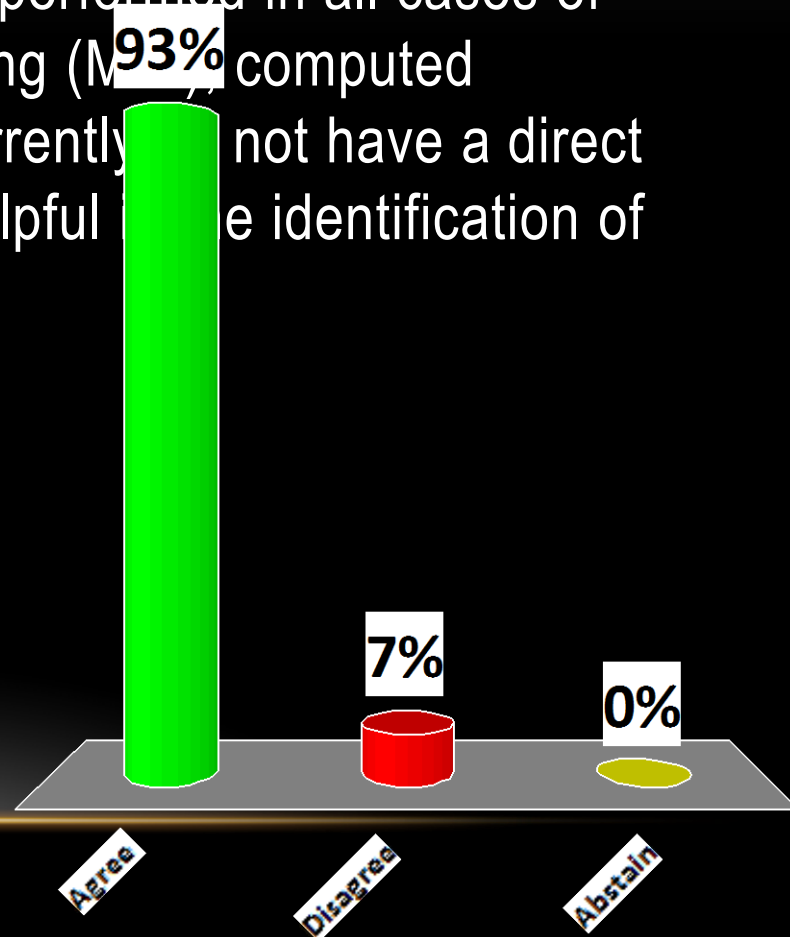
Consensus: Nucleic acid based testing is not currently a recommended routine diagnostic test for PJI. In cases with high clinical suspicion of infection but negative cultures or other diagnostic tests, molecular techniques with or without sonication may help identify the unknown pathogens or antibiotic sensitivity for targeting antimicrobial therapies.



WG VII

Question 10: Is there a role for imaging modalities in the diagnosis of PJI?

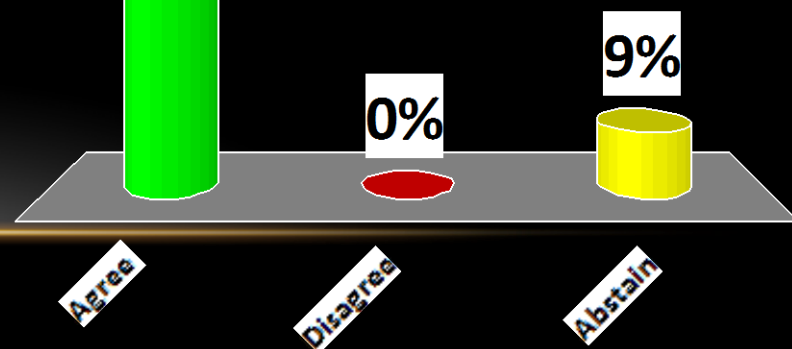
Consensus: Plain radiographs should be performed in all cases of suspected PJI. Magnetic resonance imaging (MRI), computed tomography (CT), and nuclear imaging currently do not have a direct role in the diagnosis of PJI but may be helpful in the identification of other causes of joint pain.



WG VII

Question 2: Do you agree with the American Academy of Orthopaedic Surgeons's (AAOS) algorithm for diagnosis of PJI?

Consensus: The following is an adaptation of the AAOS's algorithm for the diagnosis of PJI.³⁸ This algorithm should be applied to patients who present with a painful or failed hip or knee arthroplasty that is scheduled for revision.



WORKGROUP 8: WOUND MANAGEMENT

Liaison: Elie Ghanem MD

Leaders:

_Volkmer Heppert MD (International), Mark Spangehl (US)

Delegates:

John Abraham MD, Khalid Azzam MD, Lowry Barnes MD, Federico Jose Burgo MD, Nitin Goyal MD, Ernesto Guerra MD, Brian Hamlin MD, Kirby Hitt MD, Sofiene Kallel MD, Gregg Klein MD, Yona Kosashvili MD, Brett Levine MD, Laura Matsen MD, Michael J Morris MD, James J Purtill MD, Chitranjan Ranawat MD, FRCS, FRCSC, Gil Scuderi MD, Peter F Sharkey MD, Rafael Sierra MD, Anna Stefansdottir MD, PhD

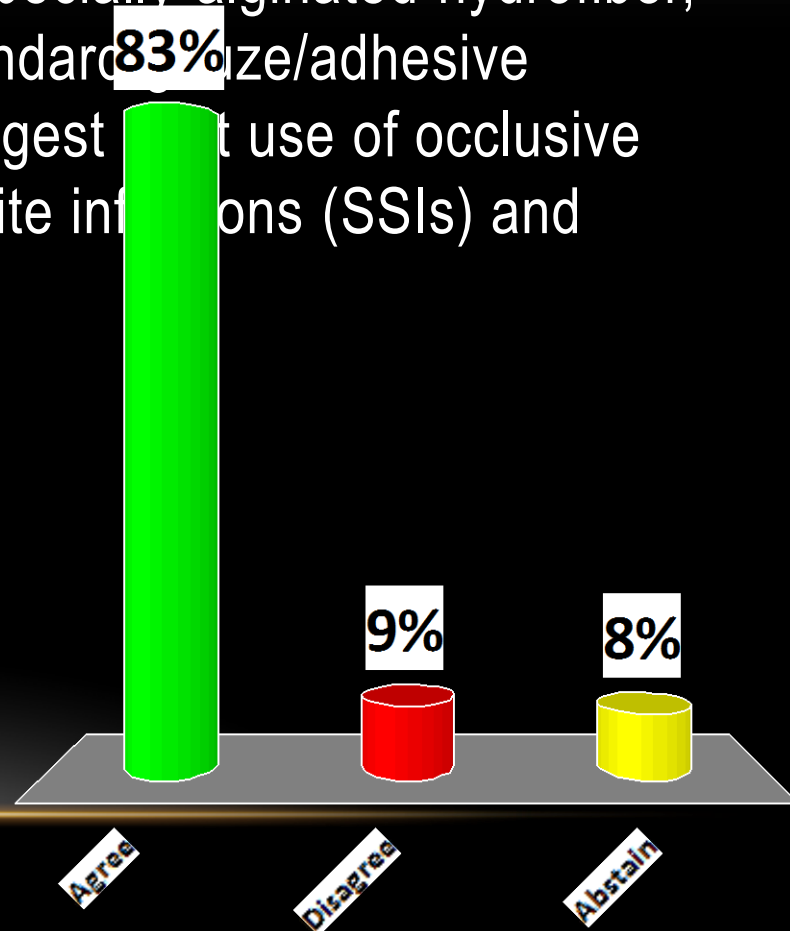
MD

WG VIII

Question 1: What is the optimal dressing for a wound after total joint arthroplasty (TJA)?

Consensus: With occlusive dressings, especially alginate hydrofiber, the rate of blistering is lower than with standard size/adhesive dressings. There is insufficient data to suggest that use of occlusive dressing may reduce the rate of surgical site infections (SSIs) and periprosthetic joint infection (PJI).

- A. Agree
- B. Disagree
- C. Abstain

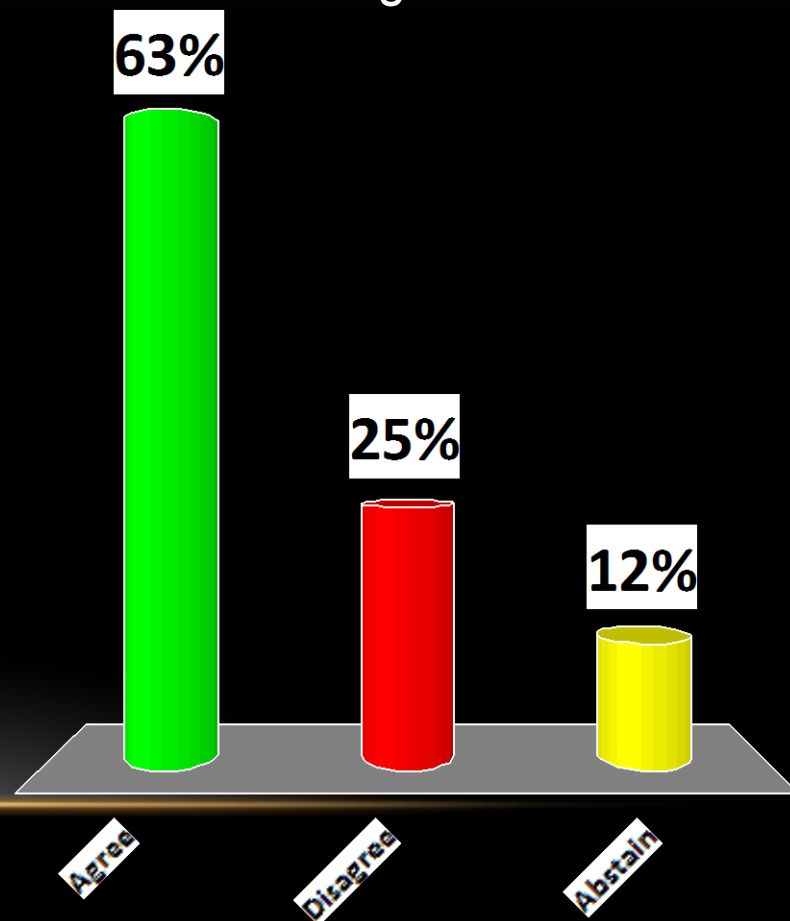


WG VIII

Question 1A: What is the optimal dressing for a wound after total joint arthroplasty (TJA)?

Consensus: We recommend the use of occlusive dressings with alginate hydrofiber, when available.

- A. Agree
- B. Disagree
- C. Abstain

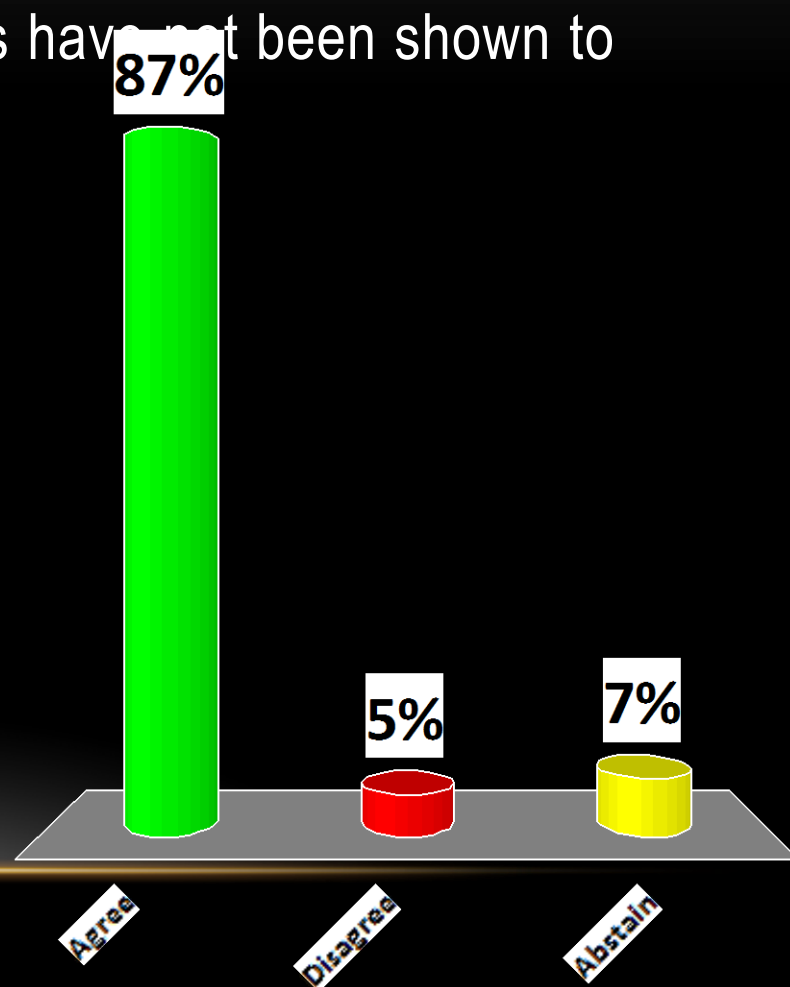


WG VIII

Question 1B : Does the use of silver-impregnated dressings reduce SSI or deep surgical infection.

Consensus: Silver-impregnated dressings have not been shown to reduce SSI or deep surgical infection.

- A. Agree
- B. Disagree
- C. Abstain

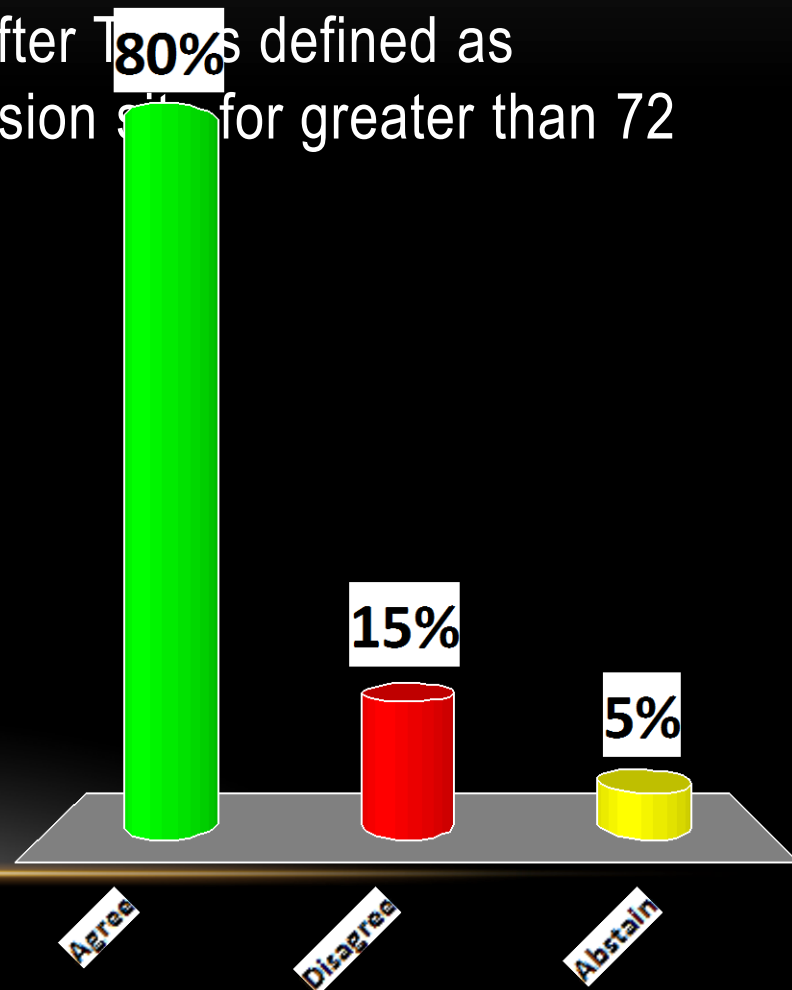


WG VIII

Question 2: What is considered to be persistent drainage from a wound after TJA?

Consensus: Persistent wound drainage after TJA defined as continued drainage from the operative incision site for greater than 72 hours.

- A. Agree
- B. Disagree
- C. Abstain

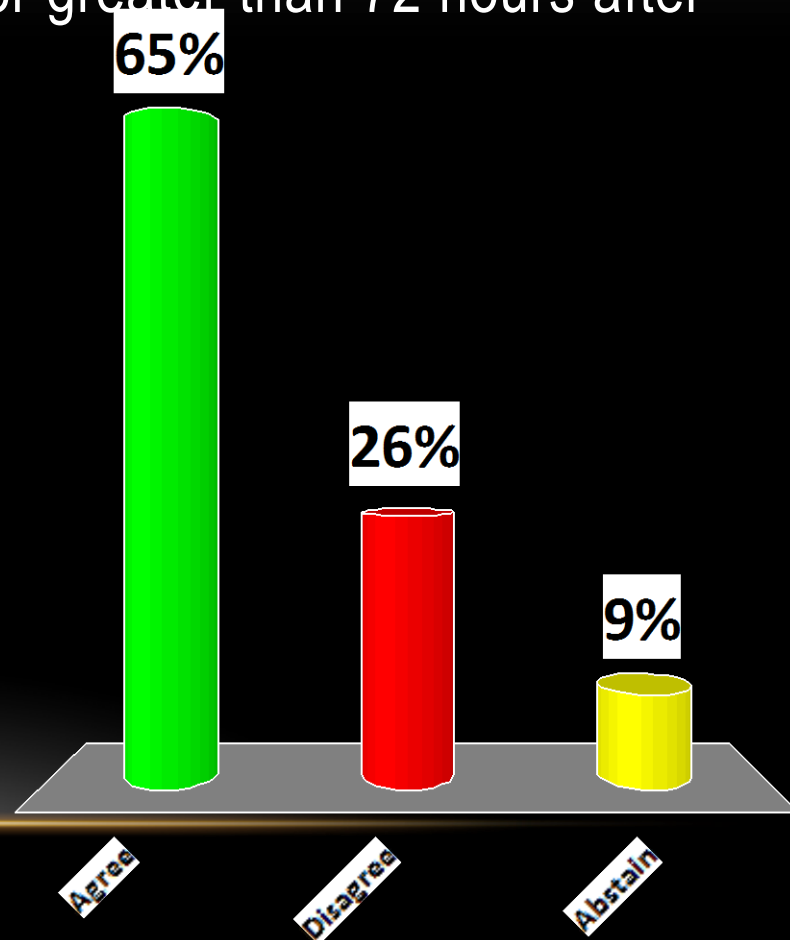


WG VIII

Question 3A: What are non-surgical strategies to address a draining wound after TJA?

Consensus: Persistent wound drainage for greater than 72 hours after TJA should be managed by wound care.

- A. Agree
- B. Disagree
- C. Abstain

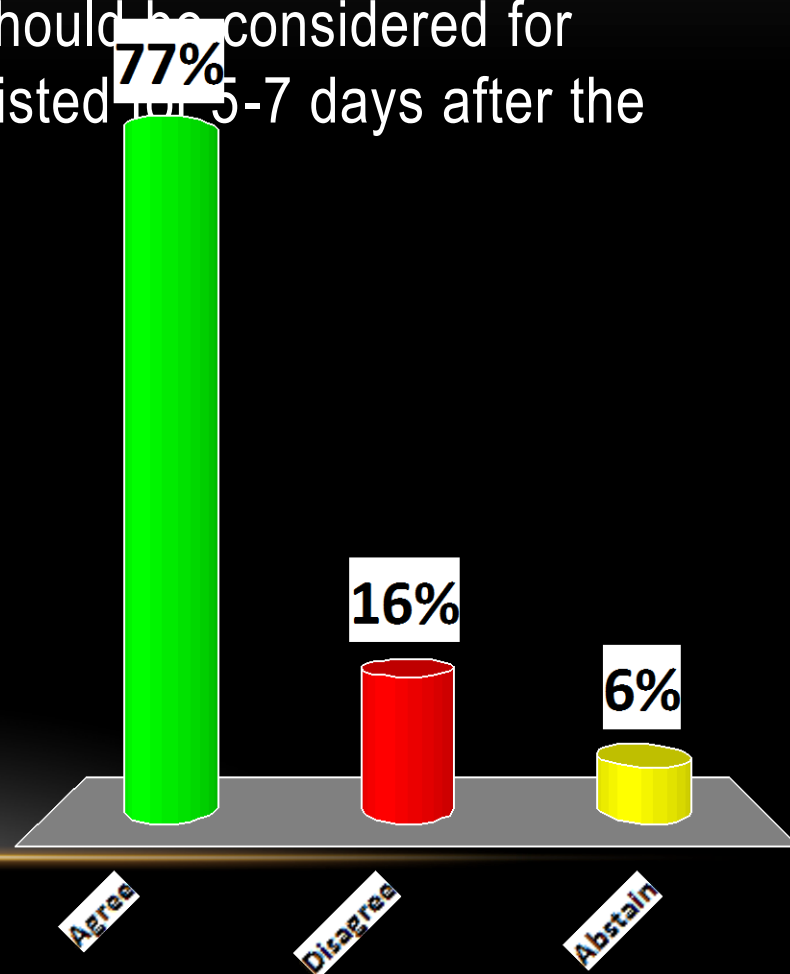


WG VIII

Question 3B: What are surgical strategies to address a draining wound after TJA?

Consensus: Persistent wound drainage should be considered for surgical management if drainage has persisted for 5-7 days after the index procedure.

- A. Agree
- B. Disagree
- C. Abstain

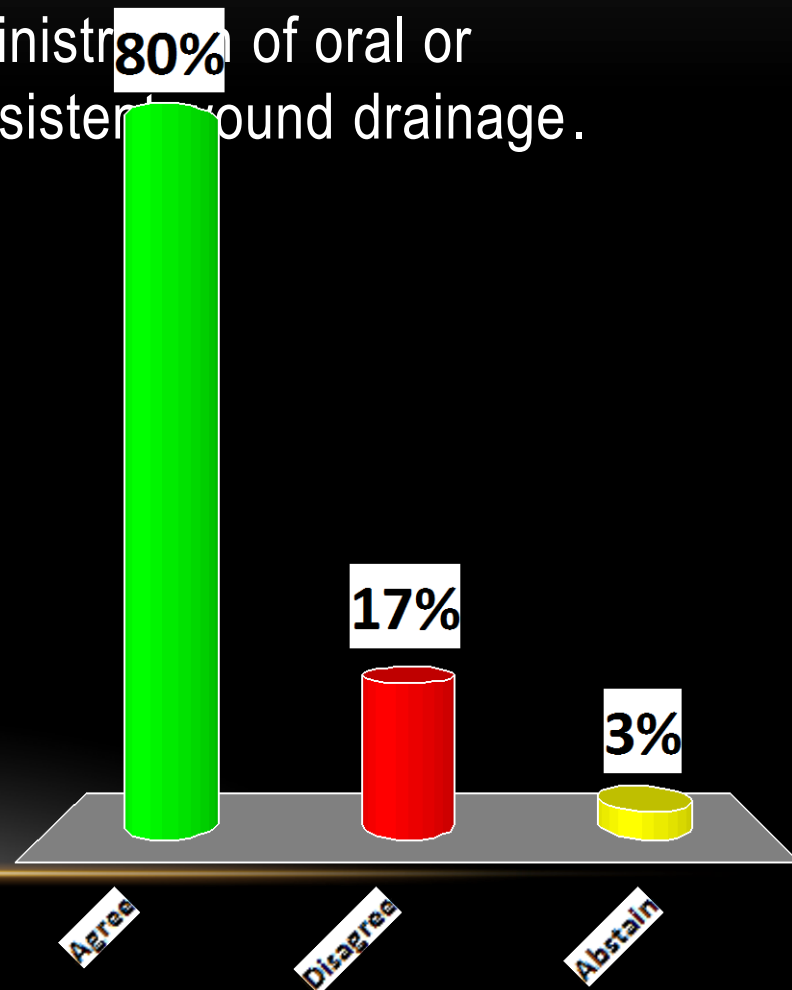


WG VIII

Question 3C: Should oral or intravenous antibiotics be administered to patients with persistent wound drainage?

Consensus: We recommend against administering oral or intravenous antibiotics to patients with persistent wound drainage.

- A. Agree
- B. Disagree
- C. Abstain

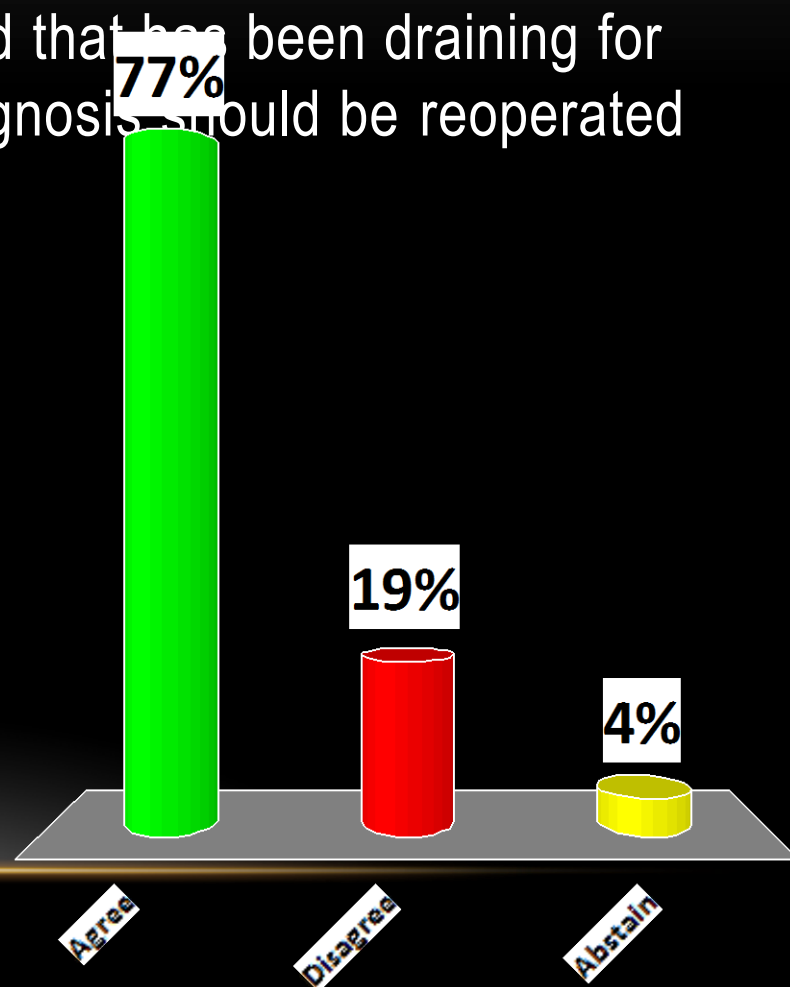


WG VIII

Question 4: What are the indications for reoperation for a persistently draining wound after TJA?

Consensus: A persistently draining wound that has been draining for greater than 5-7 days from the time of diagnosis should be reoperated on without delay.

- A. Agree
- B. Disagree
- C. Abstain



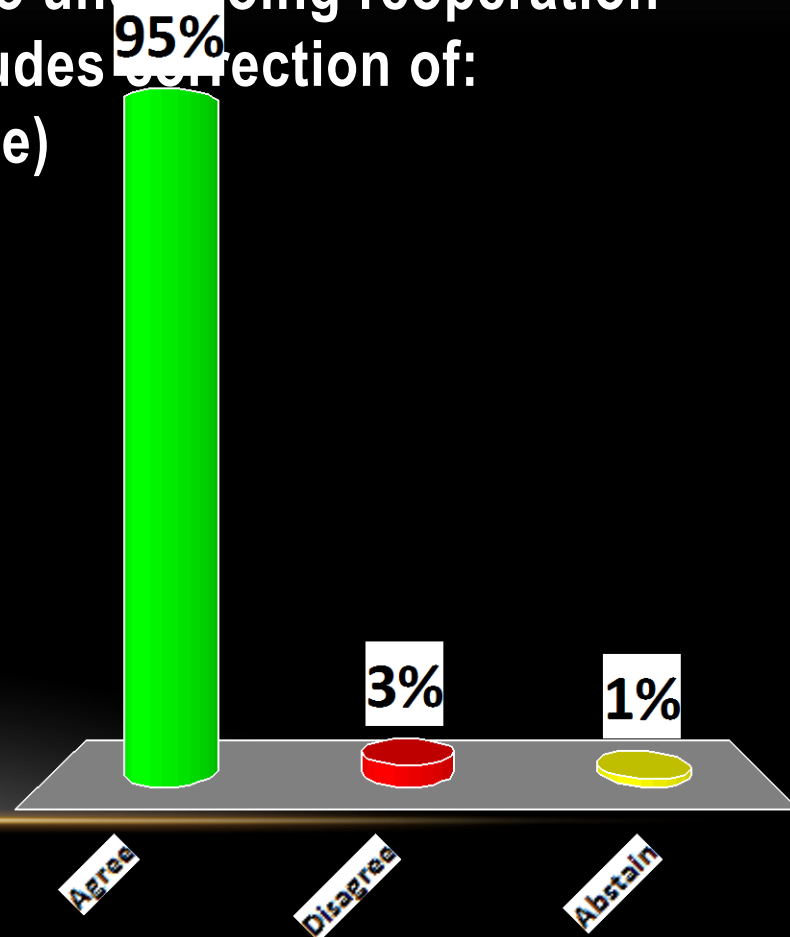
WG VIII

Question 5: How can we optimize patient status prior to reoperation to minimize SSI?

Consensus: We recommend that prior to undergoing reoperation patients should be optimized. This includes correction of:

- Malnutrition (whenever possible)
- Anticoagulation
- Anemia
- Diabetes

- A. Agree
- B. Disagree
- C. Abstain

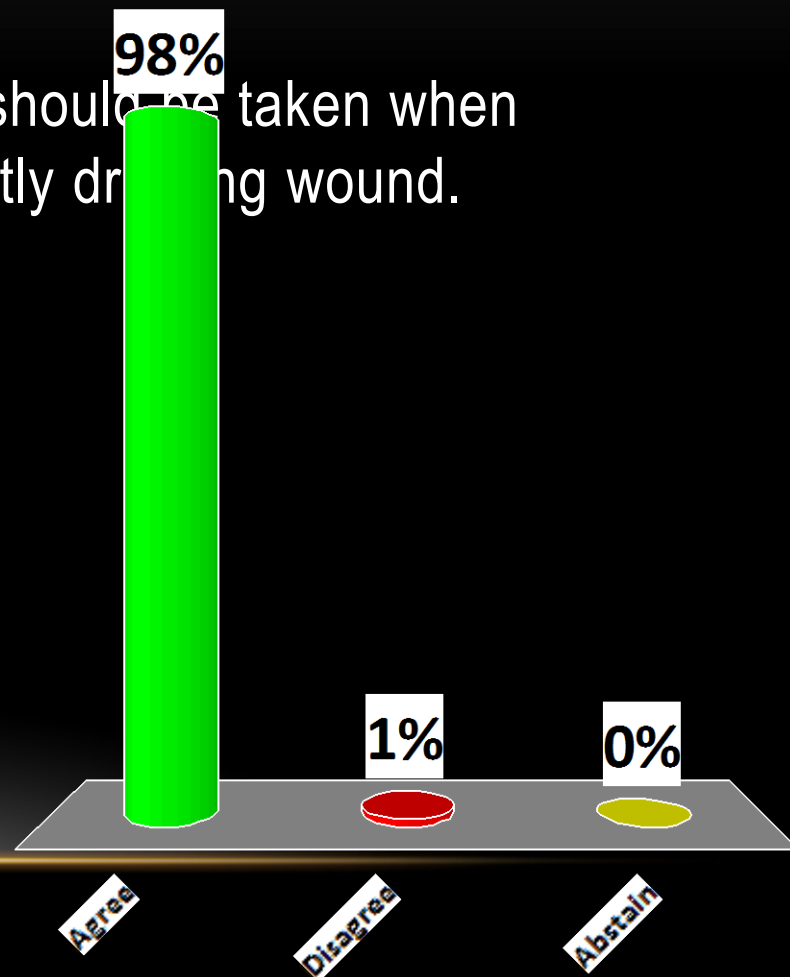


WG VIII

Question 6: Should intraoperative cultures be taken when performing I&D for a persistently draining wound after TJA?

Consensus: Yes. Intraoperative cultures should be taken when performing I&D reoperation for a persistently draining wound.

- A. Agree
- B. Disagree
- C. Abstain

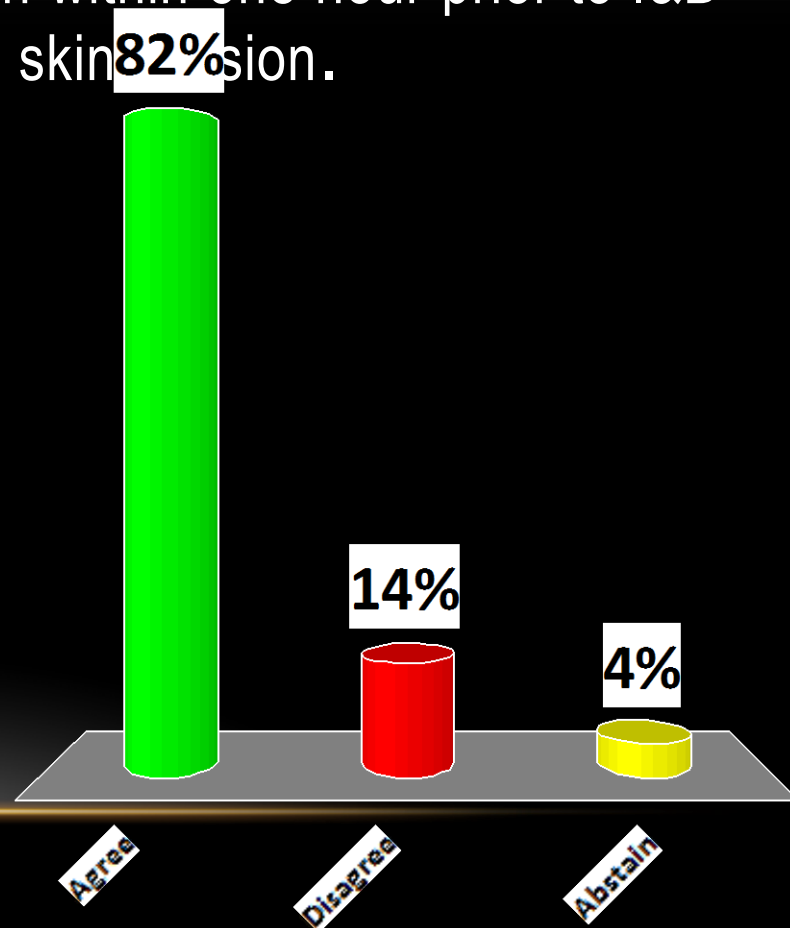


WG VIII

Question 7: Should perioperative antibiotics be withheld prior to skin incision for I&D of TJA?

Consensus: Perioperative antibiotics given within one hour prior to I&D reoperation should not be withheld prior to skin incision.

- A. Agree
- B. Disagree
- C. Abstain

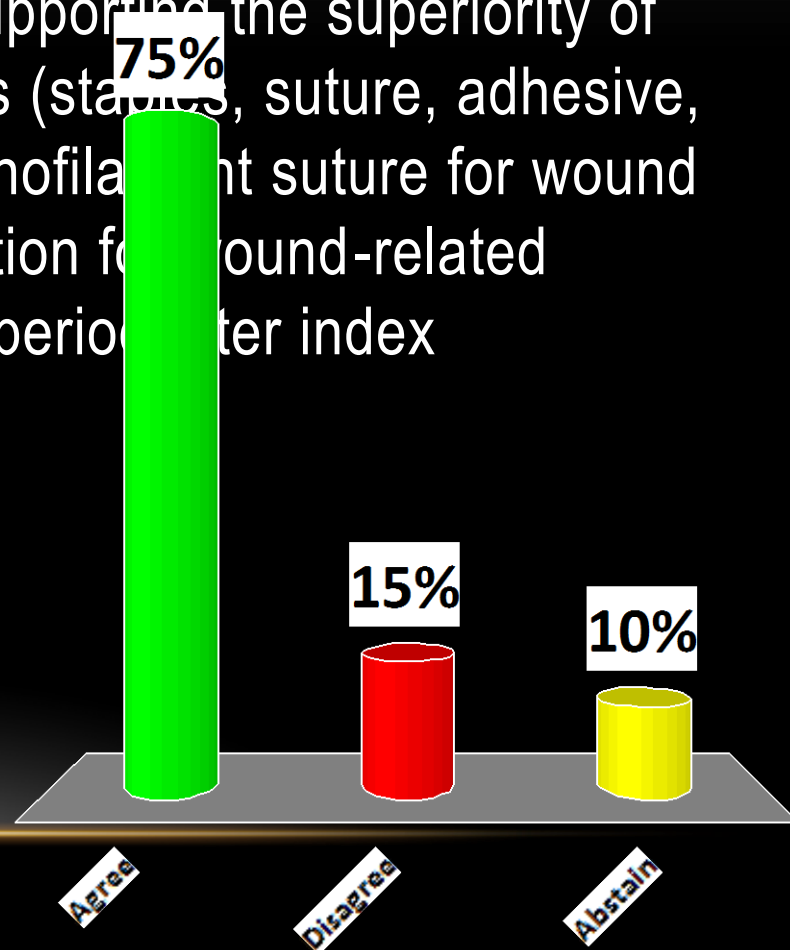


WG VIII

Question 8: What is the optimal method for wound closure after TJA to minimize the risk of SSI and PJI?

Consensus: Despite lack of evidence supporting the superiority of one technique of skin closure over others (staples, suture, adhesive, or tapes). We recommend the use of monofilament suture for wound closure in patients who undergo reoperation for wound-related problems during the early postoperative period after index arthroplasty.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 9: SPACERS

Liaison: Mustafa Citak MD

Leaders: Joel Argenson MD, Bas Masri MD (International), Bryan Springer (US), Daniel Kendoff

Delegates:

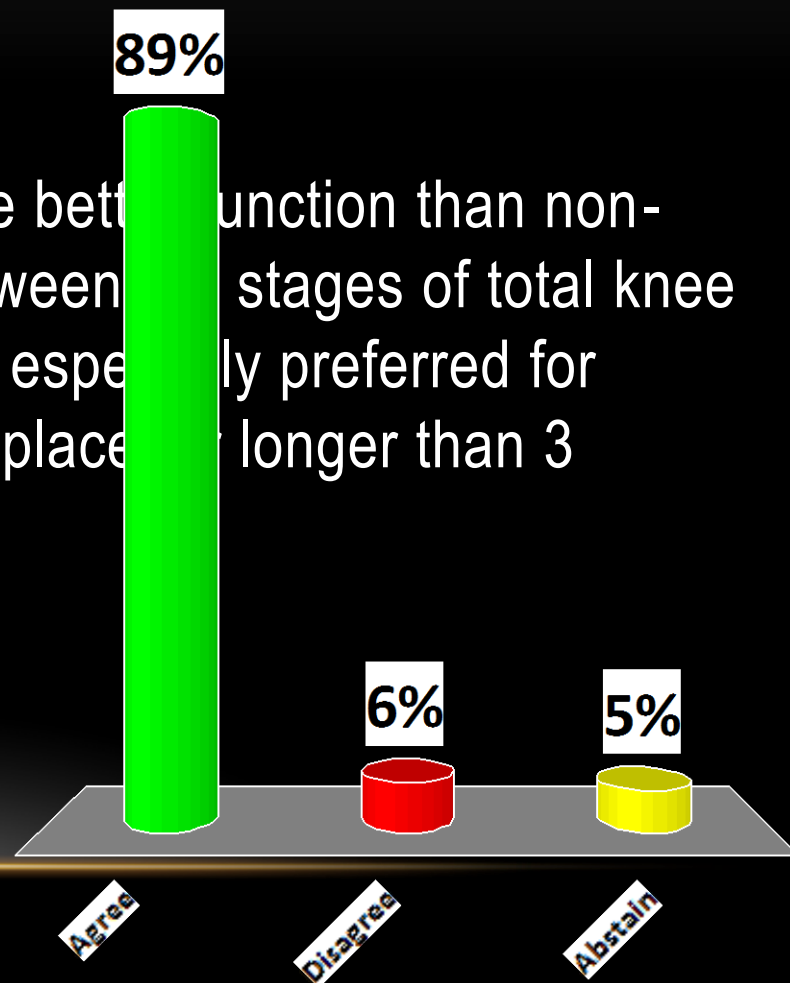
Volker Alt, K Anagnostakos, A Baldini, Quanjun Cui MD, Gregory K Deirmengian MD, Hernan del Sel, Michael Harrer MD, A Hernandez, C Israelite, David Jahoda MD, Paul Jutte PhD, Eric Levicoff MD, S McDonald, Enzo Meani MD, F Motta, Oleg Safir MD, K Shah, Matthew W Squire MD, Michael J Taunton MD, C Vogely MD, S Wellman

WG IX

Question 1A: Is there a functional difference in the use of non-articulating or articulating spacers for treatment of periprosthetic joint infection (PJI) in the knee, in between stages?

Consensus: Articulating spacers provide better function than non-articulating spacers for the patient in between stages of total knee arthroplasty (TKA). Articulating spacer is especially preferred for patients who are likely to have spacer in place for longer than 3 months.

- A. Agree
- B. Disagree
- C. Abstain

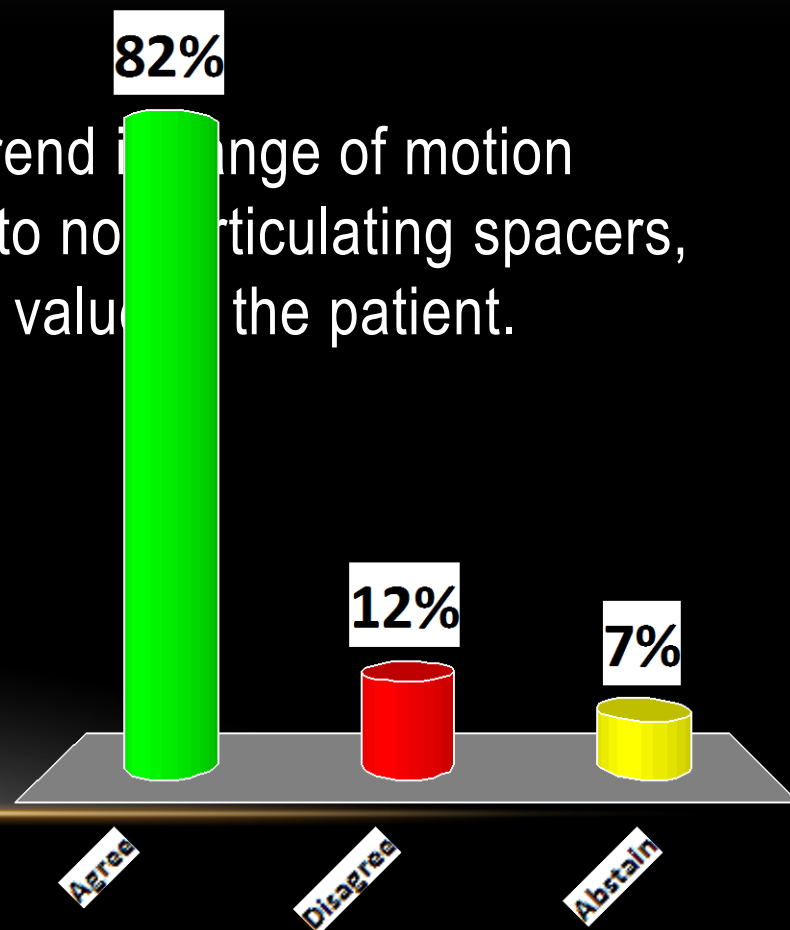


WG IX

Question 1A1: Is there a functional difference in the use of non-articulating or articulating spacers for treatment of periprosthetic joint infection (PJI) in the knee at minimum two years after reimplantation?

Consensus: There is a non-significant trend in range of motion improvement with articulating compared to non-articulating spacers, but the panels believes that this is still of value to the patient.

- A. Agree
- B. Disagree
- C. Abstain

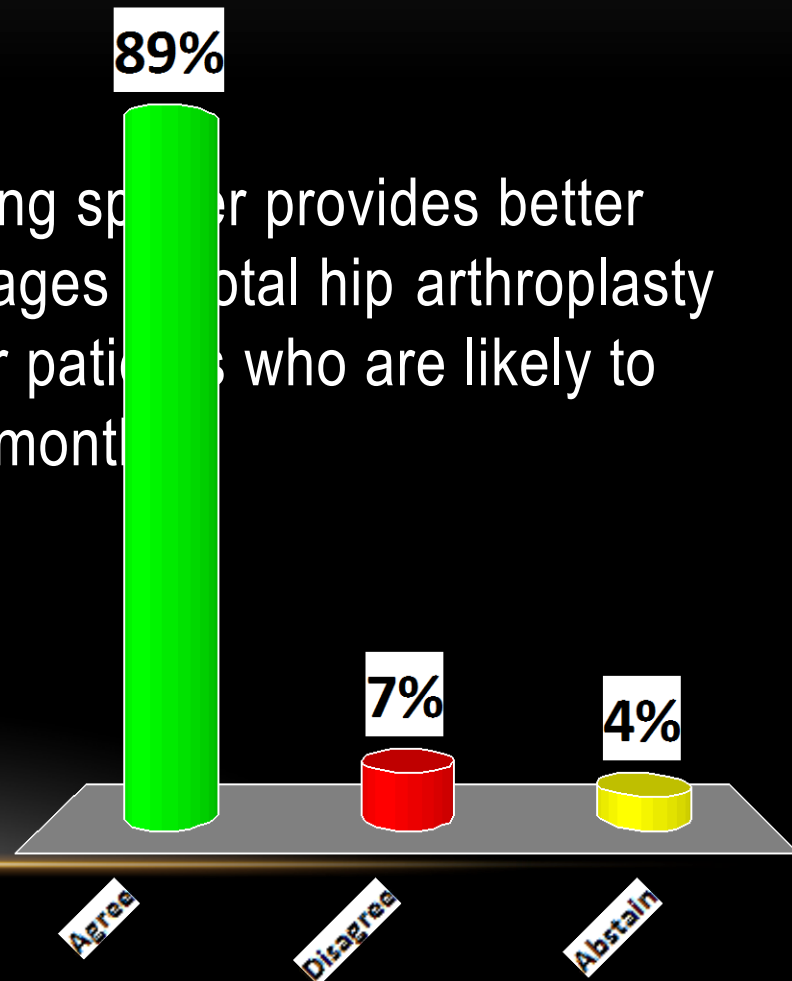


WG IX

Question 1B: Is there a functional difference in the use of non-articulating or articulating spacers for the treatment of PJI in the hip, in between stages of two-stage exchange arthroplasty?

Consensus: A well performing articulating spacer provides better function for the patient in between the stages of total hip arthroplasty (THA). These are especially preferred for patients who are likely to have a spacer in place for longer than 3 months.

- A. Agree
- B. Disagree
- C. Abstain

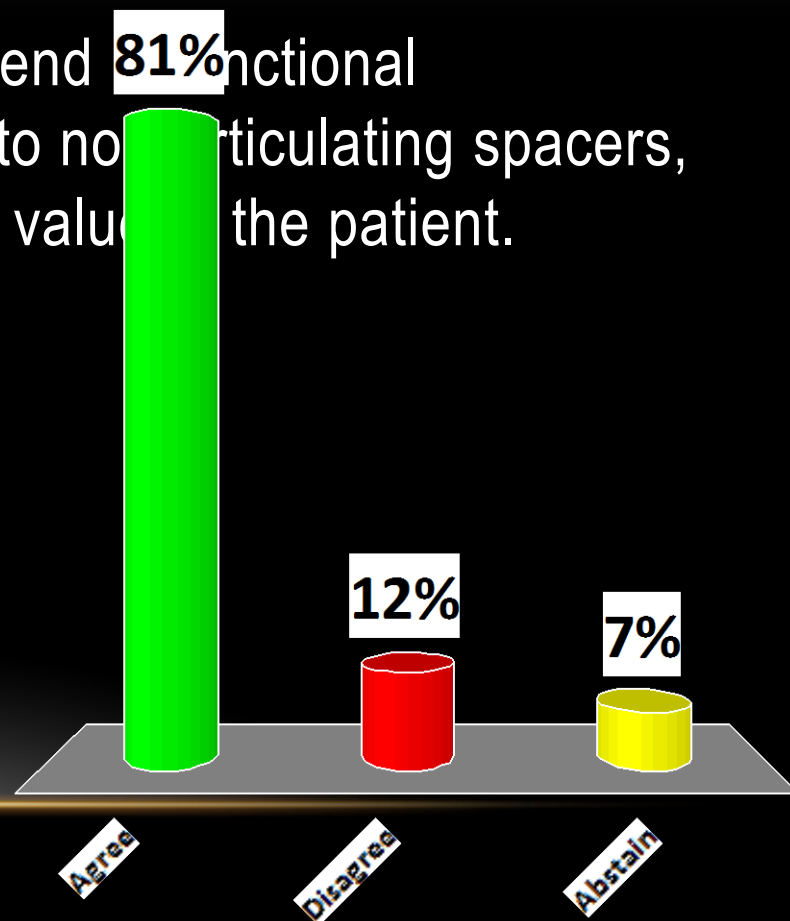


WG IX

Question 1B1: Is there a functional difference in the use of non-articulating or articulating spacers for the treatment of PJI in the hip, at minimum two years after reimplantation?

Consensus: There is a non-significant trend for functional improvement with articulating compared to non-articulating spacers, but the panels believes that this is still of value to the patient.

- A. Agree
- B. Disagree
- C. Abstain

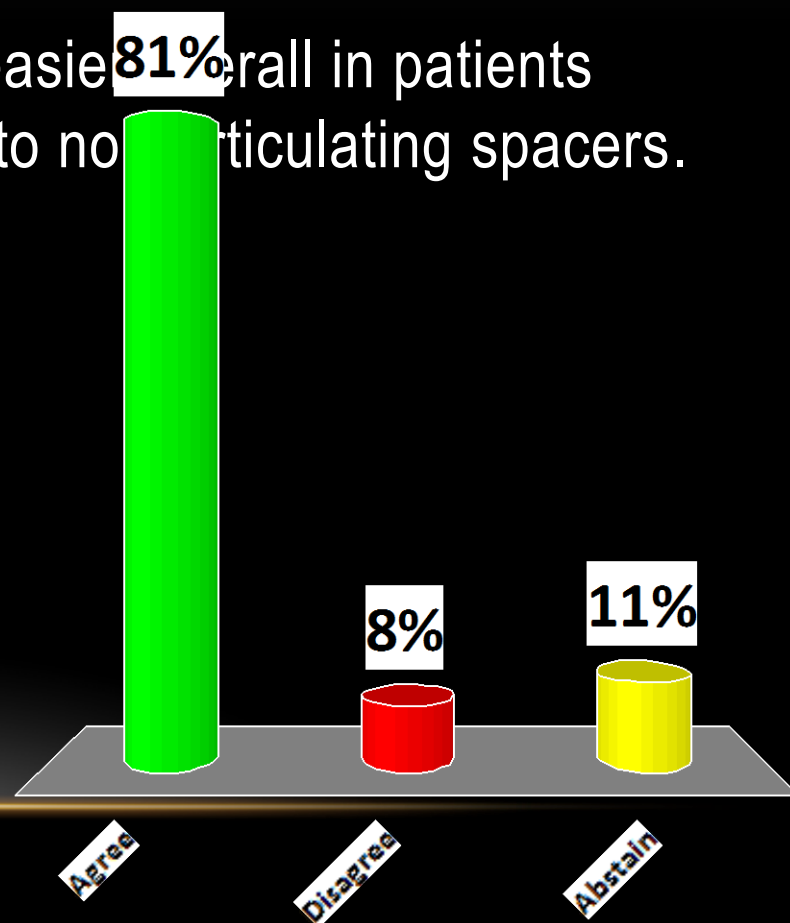


WG IX

Question 1C: Is there a difference in reimplantation (surgical ease) with the use of non-articulating or articulating spacers for treatment of PJI in the knee and hip?

Consensus: Reimplantation surgery is easier overall in patients receiving articulating spacers compared to non-articulating spacers.

- A. Agree
- B. Disagree
- C. Abstain

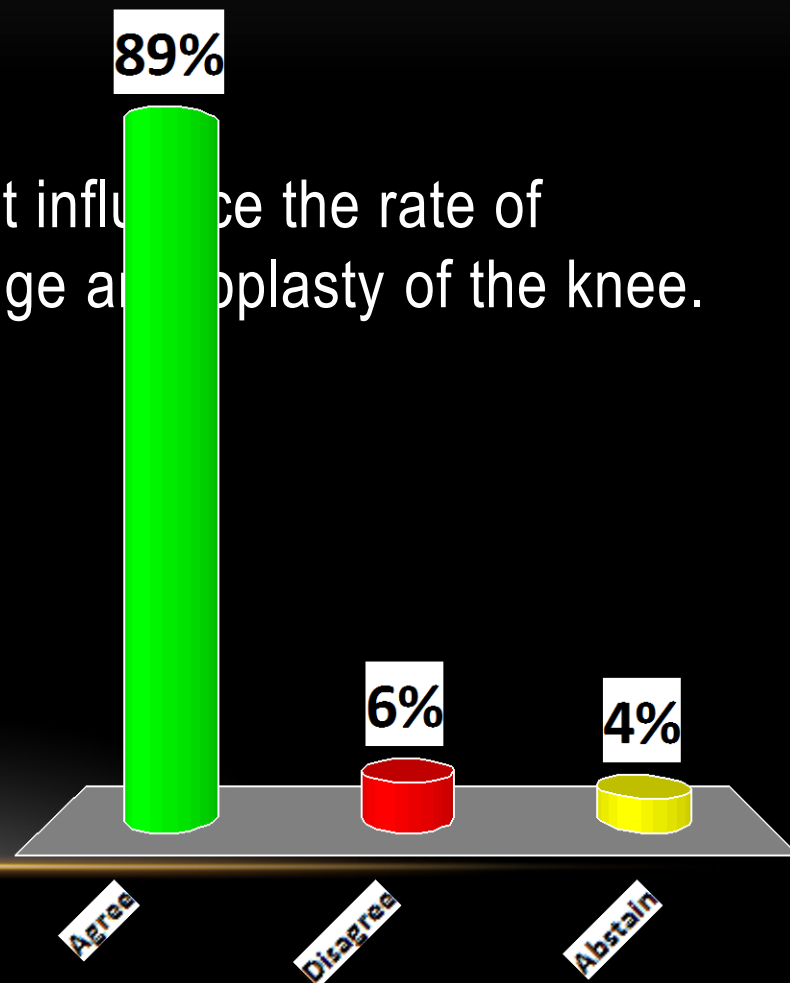


WG IX

Question 2A: Is there a difference with regards to control of infection with the use of articulating or non-articulating spacers in the knee?

Consensus: The type of spacer does not influence the rate of infection eradication in two-stage exchange arthroplasty of the knee.

- A. Agree
- B. Disagree
- C. Abstain

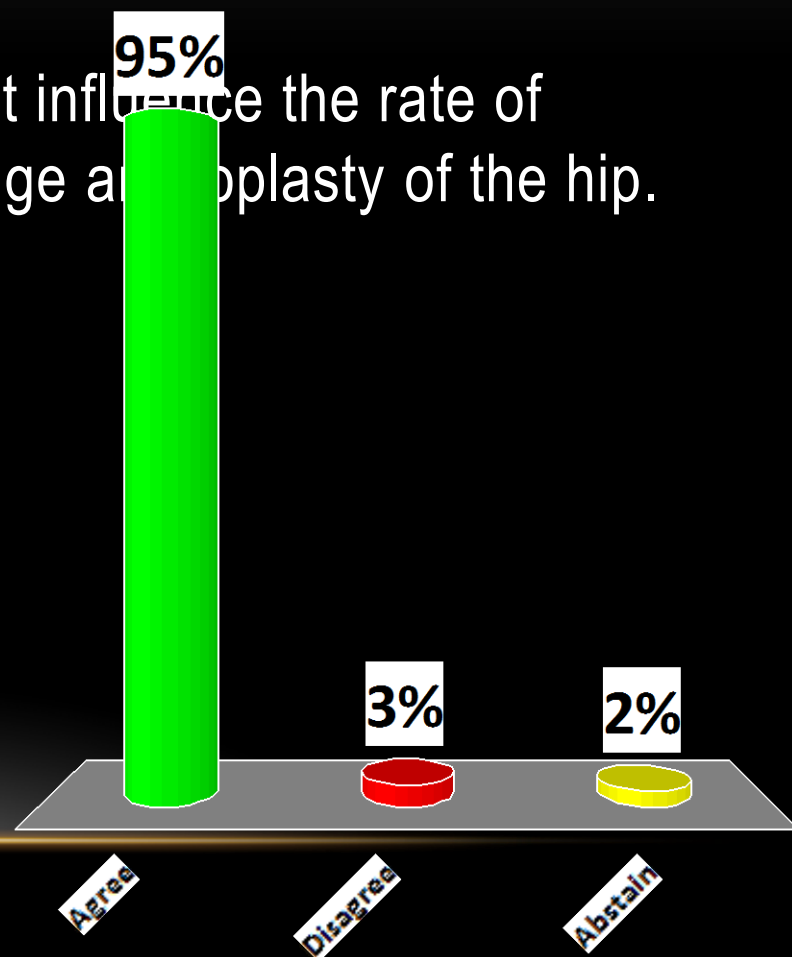


WG IX

Question 2B: Is there a difference with regards to control of infection with the use of articulating or non-articulating spacers in the hip?

Consensus: The type of spacer does not influence the rate of infection eradication in two-stage exchange arthroplasty of the hip.

- A. Agree
- B. Disagree
- C. Abstain

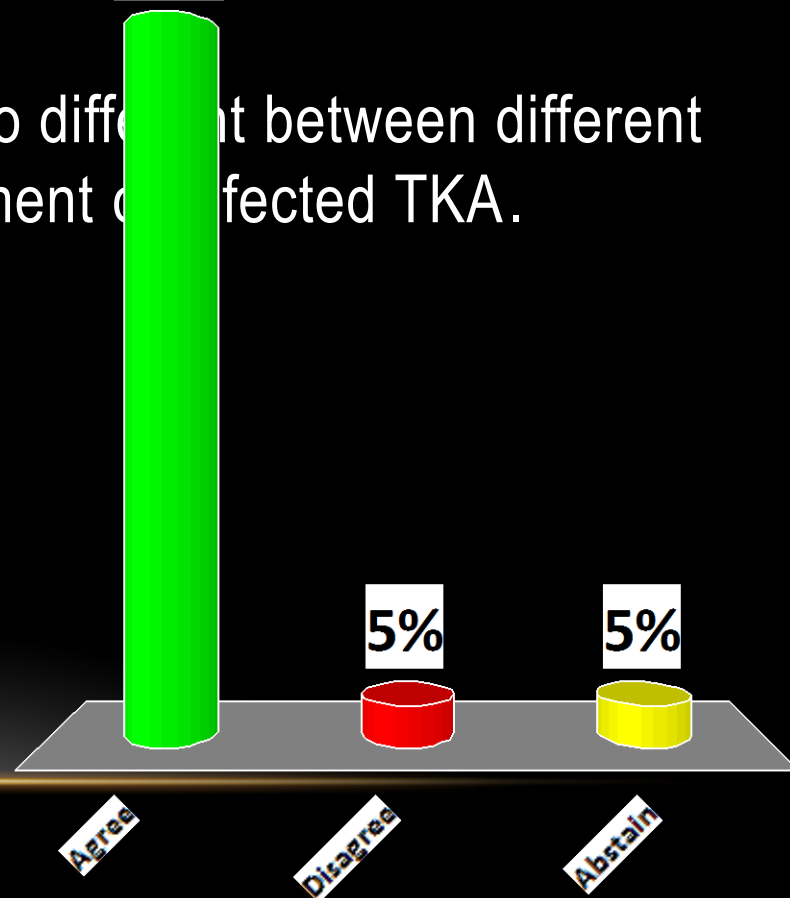


WG IX

Question 3: Is there a difference with regards to control of infection between different types of articulating spacers (cemented molds, PROSTALAC, Hoffman, or commercially available prefabricated spacers) used in the knee?

Consensus: Control of the infection is no different between different types of articulating spacers in the treatment of infected TKA.

- A. Agree
- B. Disagree
- C. Abstain

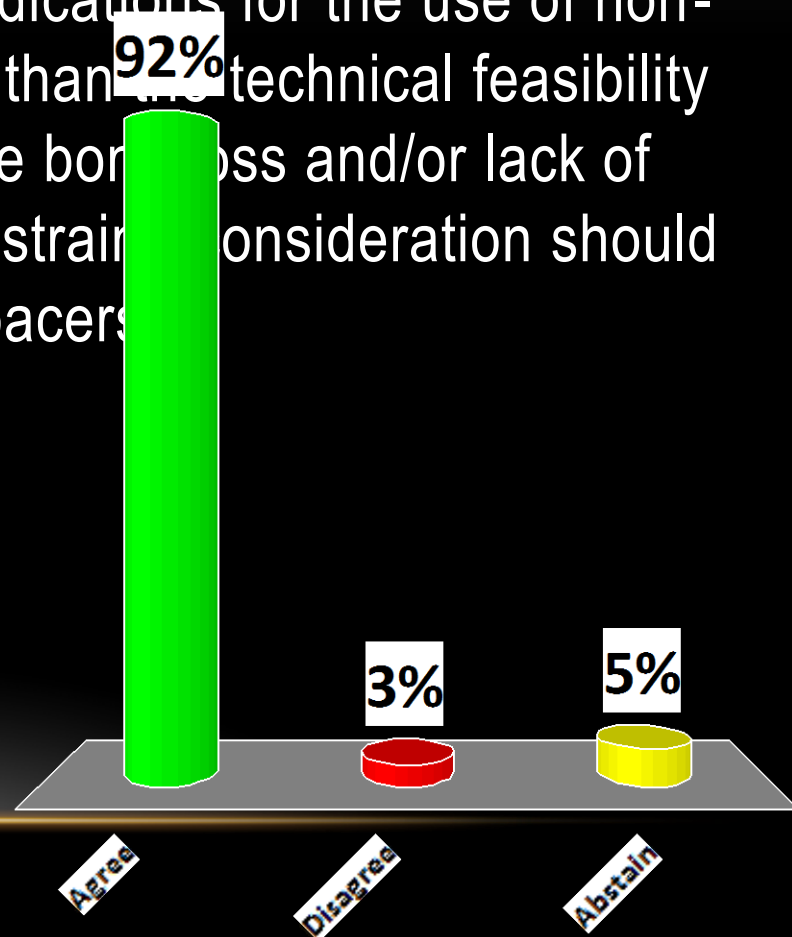


WG IX

Question 4: Are there contraindications for the use of non-articulating and/or articulating spacers?

Consensus: There are no clear contraindications for the use of non-articulating or articulating spacers, other than the technical feasibility of the procedure. In patients with massive bone loss and/or lack of integrity of soft-tissues or ligamentous restraints, consideration should be given to the use of non-articulating spacers.

- A. Agree
- B. Disagree
- C. Abstain

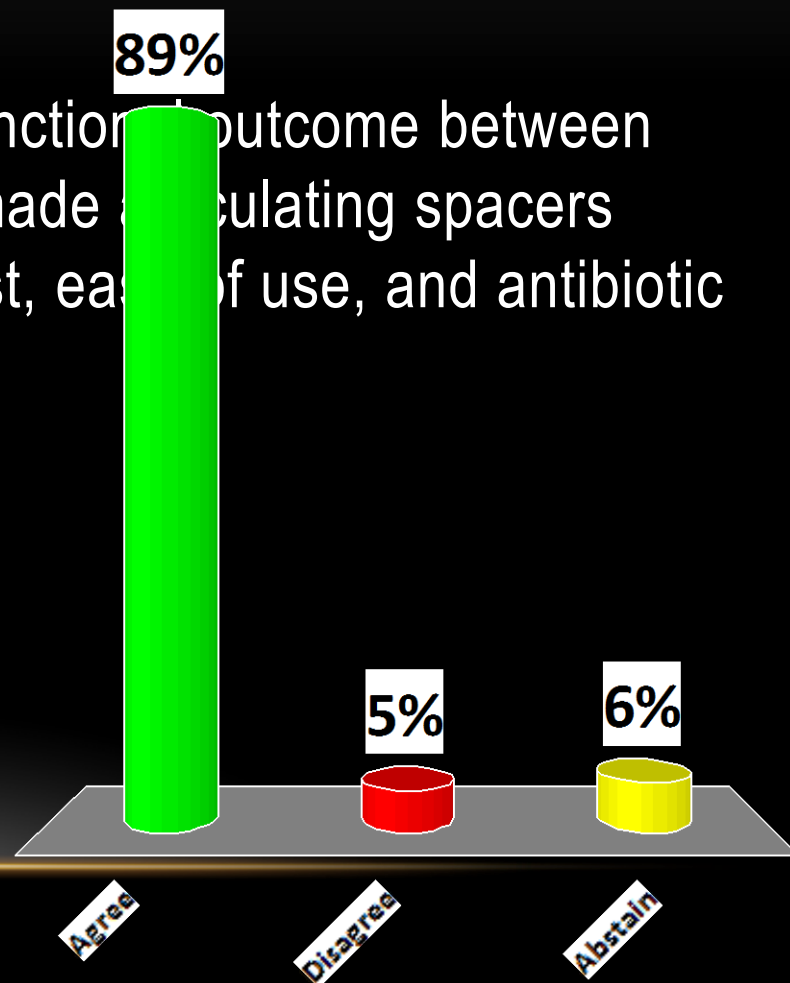


WG IX

Question 5A: Are there any differences in functional outcome between manufactured spacers versus surgeon-made dynamic spacers used in the knee?

Consensus: There is no difference in functional outcome between manufactured spacers versus surgeon-made articulating spacers used in the knee. However, issues of cost, ease of use, and antibiotic delivery should be considered.

- A. Agree
- B. Disagree
- C. Abstain

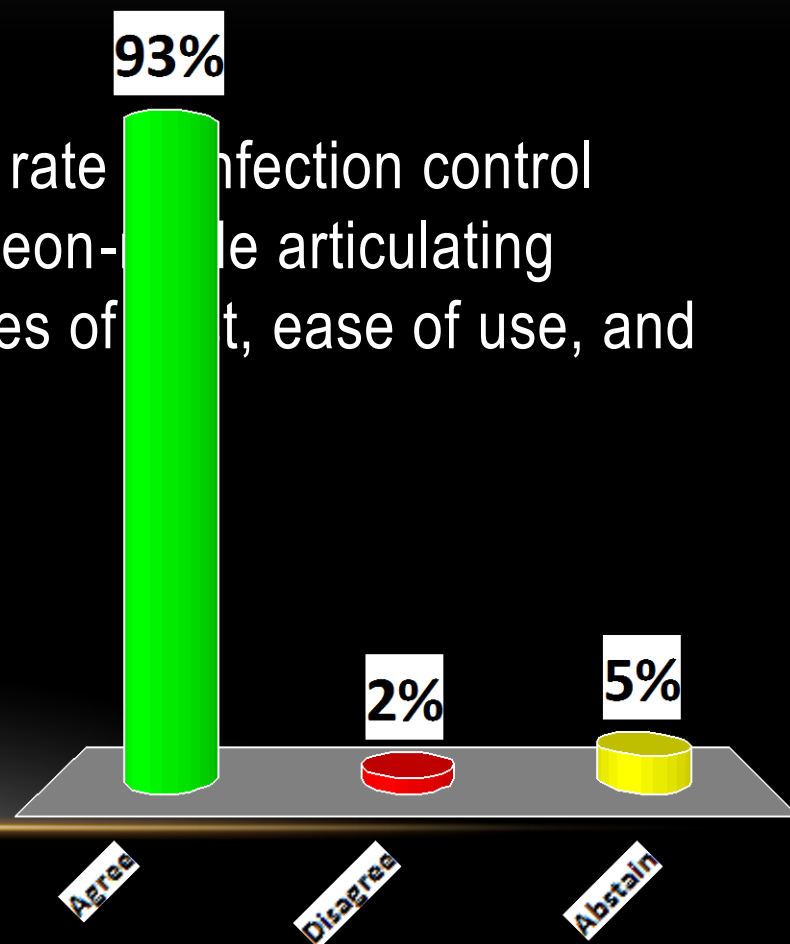


WG IX

Question 5B: Are there any differences in rate of infection control between manufactured spacers versus surgeon-made articulating spacers used in the knee?

Consensus: There are no differences in rate of infection control between manufactured spacers and surgeon-made articulating spacers used in the knee. However, issues of cost, ease of use, and antibiotic delivery should be considered.

- A. Agree
- B. Disagree
- C. Abstain

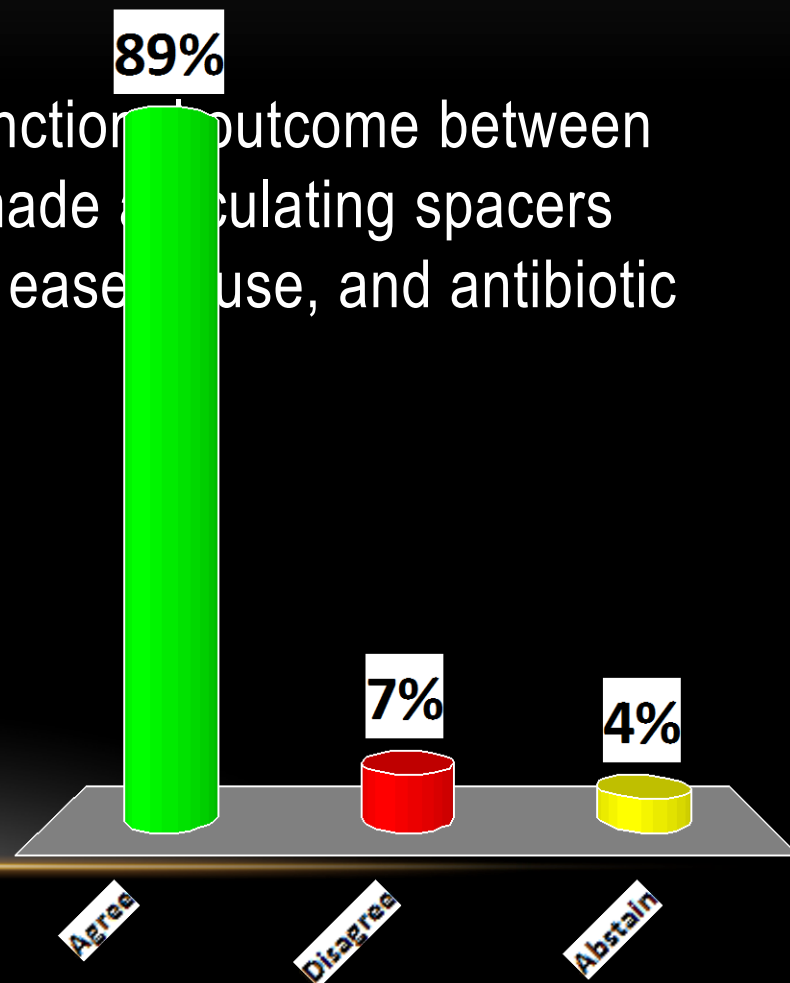


WG IX

Question 6A: Are there any differences in functional outcome between manufactured spacers versus surgeon-made dynamic spacers used in the hip?

Consensus: There is no difference in functional outcome between manufactured spacers versus surgeon-made articulating spacers used in the hip. However, issues of cost, ease of use, and antibiotic delivery should be considered.

- A. Agree
- B. Disagree
- C. Abstain

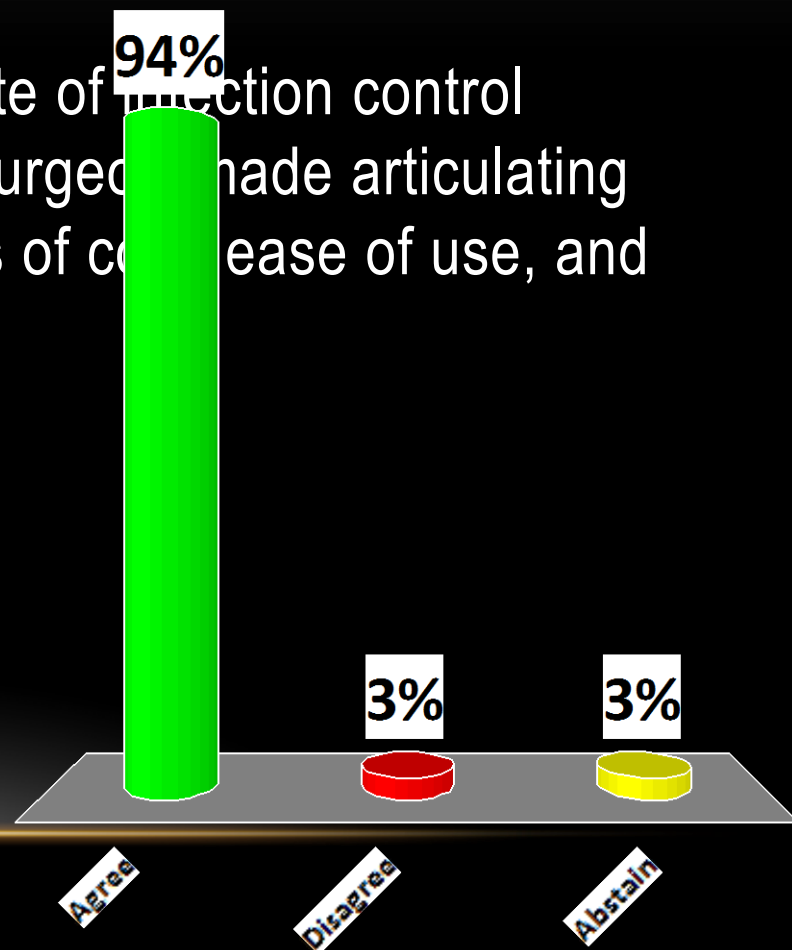


WG IX

Question 6B: Are there any differences in in rate of infection control between manufactured spacers versus surgeon-made dynamic spacers used in the hip?

Consensus: There is no difference in rate of infection control between manufactured spacers versus surgeon-made articulating spacers used in the hip. However, issues of cost, ease of use, and antibiotic delivery should be considered.

- A. Agree
- B. Disagree
- C. Abstain

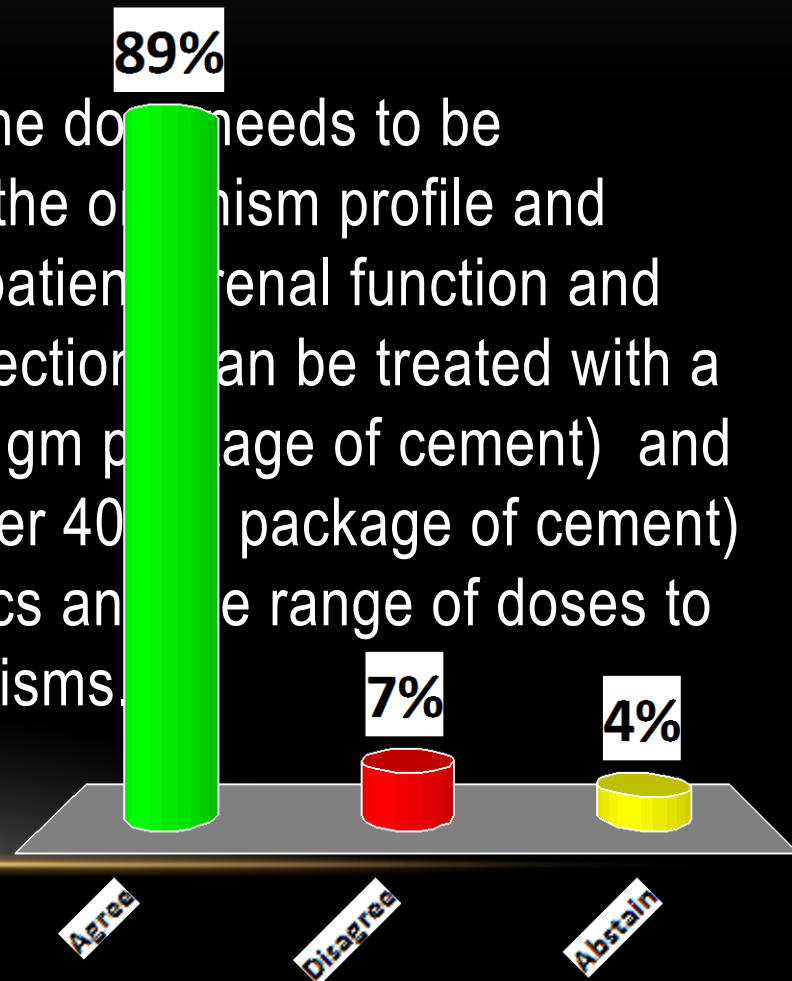


WG IX

Question 7: Which antibiotic should be used and how much of it should be added to cement spacers?

Consensus: The type of antibiotic and the dose needs to be individualized for each patient based on the organism profile and antibiogram (if available) as well as the patient's renal function and allergy profile. Having said that, most infections can be treated with a spacer with Vancomycin (1- 4 gm per 40 gm package of cement) and tobramycin or gentamicin (2.4-4.8 gms per 40 gm package of cement). We provide a list of all available antibiotics and the range of doses to be used against common infecting organisms.

- A. Agree
- B. Disagree
- C. Abstain

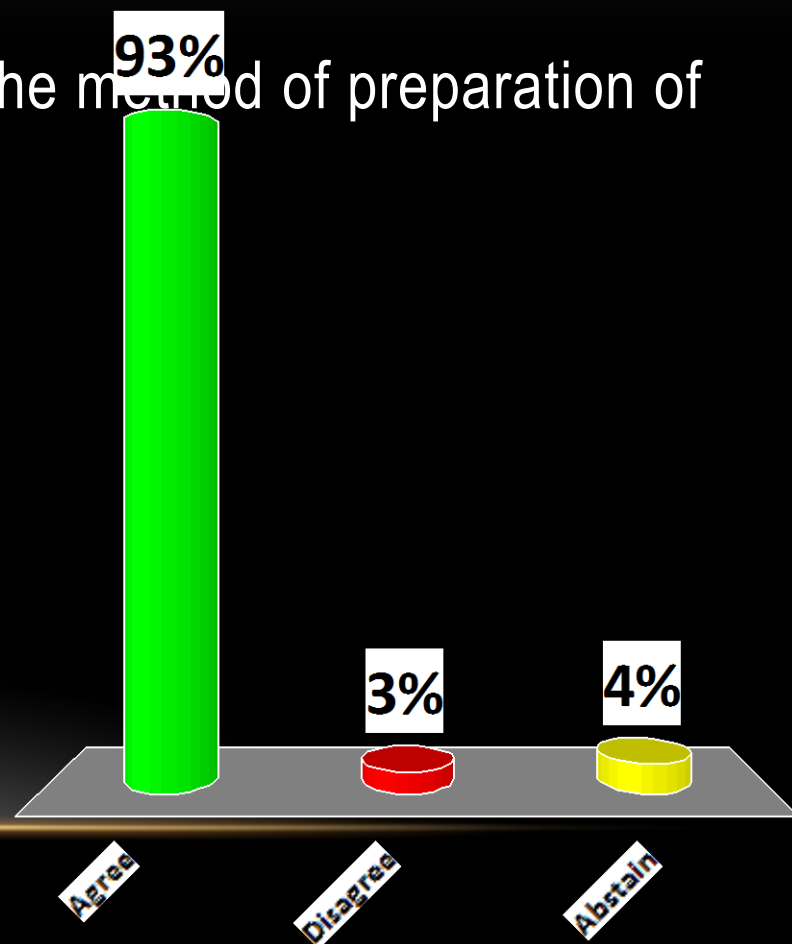


WG IX

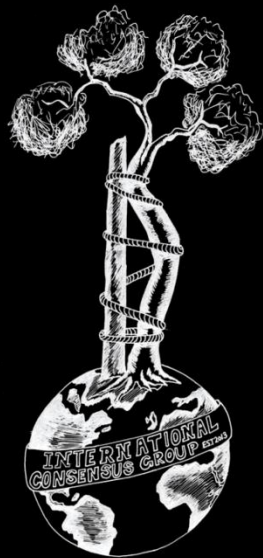
Question 8: What is the optimal technique for preparing a high-dose antibiotic cement spacer (mixing, when and how to add antibiotics, and porosity)?

Consensus: There is no consensus on the method of preparation of high-dose antibiotic cement spacers.

- A. Agree
- B. Disagree
- C. Abstain



Welcome



INTERNATIONAL
CONSENSUS MEETING

WORKGROUP 10: IRRIGATION AND DEBRIDEMENT

Liaison: Carl Haasper MD

Leaders:

Martin Buttarro MD (International), William Hozack MD

Delegates:

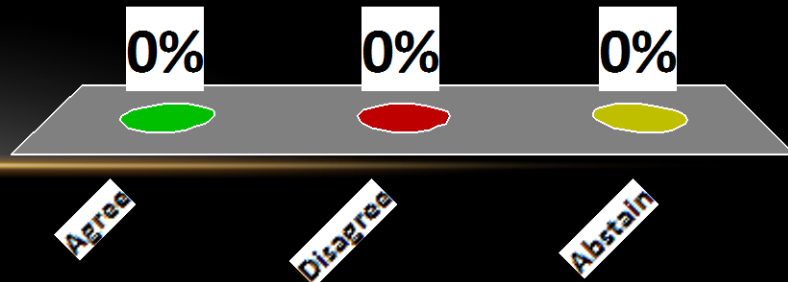
Craig A Aboltins MD, Olivier Borens MD, JJ Callaghan MD, Pedro Ivo Carvalho MD, Pablo Corona MD, Ferdinando Da Rin MD, Silvano Esposito MD, Xavier Flores MD, Donaldo Neftali Manzo Herrera MD, Gwo-Chin Lee MD, SM Javad Mortazavi MD, Nicolas O Noiseux MD, Martinez Pastor MD, Del H Schutte MD, Daniel Schweitzer MD, Rihard Trebše MD, Eleftherios Tsiridis MD, R van der Rijt MD, Leo Whiteside MD

WG X

Question 1A: When can irrigation and debridement (I&D) be considered?

Consensus: I&D may be performed for early postoperative infections that occur within 3 months of index primary arthroplasty with less than 3 weeks of symptoms.

- A. Agree
- B. Disagree
- C. Abstain

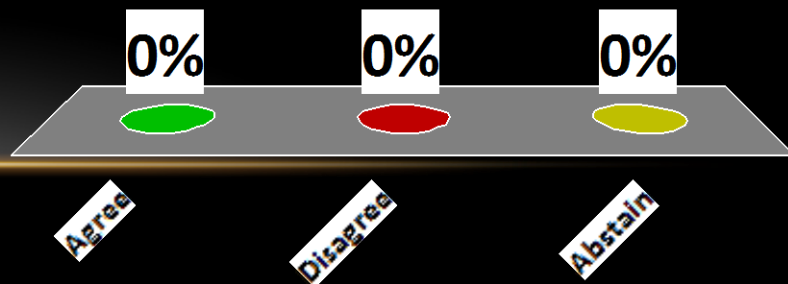


WG X

Question 1B: When can irrigation and debridement (I&D) be considered for late hematogenous infections?

Consensus: I&D may be performed for patients with late hematogenous infection that occurred within 3 weeks of an inciting event or with symptoms not longer than 3 weeks.

- A. Agree
- B. Disagree
- C. Abstain

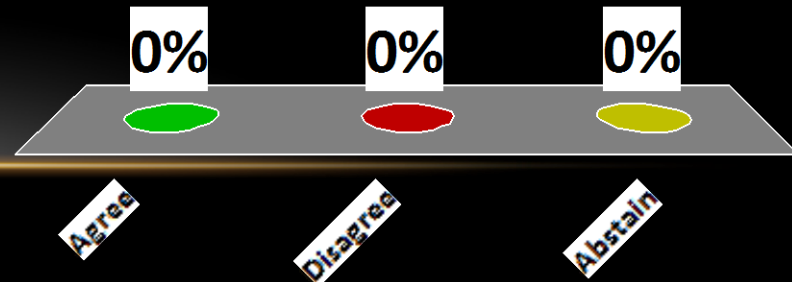


WG X

Question 2: What are the contraindications for I&D?

Consensus: Inability to close the wound or presence of sinus tract are absolute contraindications to performing I&D and retention of the prosthesis. Another absolute contraindication is a loose prosthesis.

- A. Agree
- B. Disagree
- C. Abstain

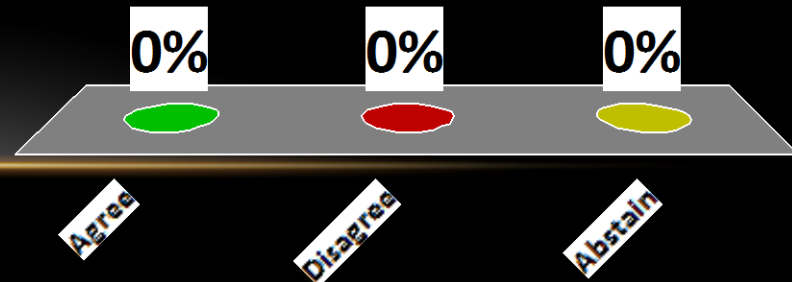


WG X

Question 3A: When performing I&D for hematoma after TKA, should deep fascia be opened?

Consensus: The fascia/arthrotomy should always be opened in patients with total knee arthroplasty (TKA) and hematoma formation.

- A. Agree
- B. Disagree
- C. Abstain

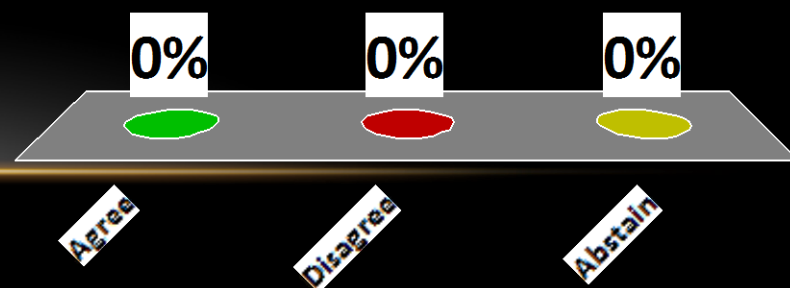


WG X

Question 3B: When performing I&D for hematoma after THA, should deep fascia be opened?

Consensus: Aspiration of the joint, either prior to surgery or at the time of I&D, should be performed. For patients with clear fascial defect or hematoma/fluid deep to fascia confirmed by aspiration, the fascia should be opened.

- A. Agree
- B. Disagree
- C. Abstain



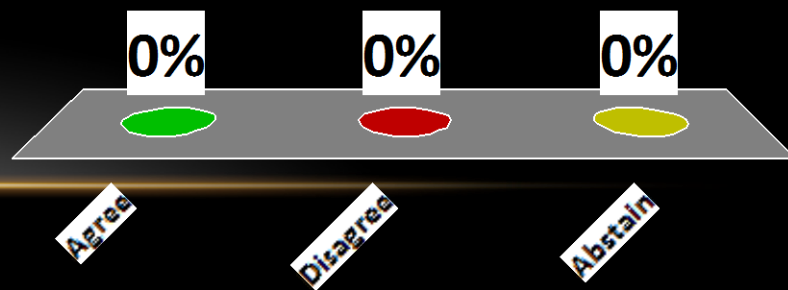
WG X

Question 4: How should I&D be performed for PJI?

Consensus: I&D of a prosthetic joint needs to be performed meticulously and according to the detailed protocol provided. Briefly this includes

- Preoperative optimization of the patient
- Good visualization and thorough debridement
- Obtaining multiple culture samples
- Copious irrigation (6-9 L) of the joint
- Explantation of the prosthesis if indicated

- A. Agree
- B. Disagree
- C. Abstain

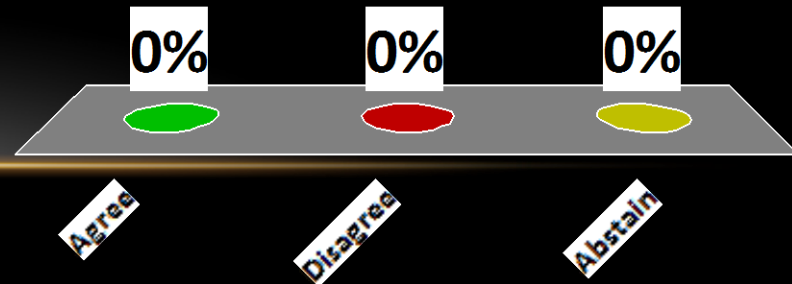


WG X

Question 5: Should the modular part always be exchanged during I&D?

Consensus: Yes. All modular components should be removed and exchanged, if possible, during I&D.

- A. Agree
- B. Disagree
- C. Abstain

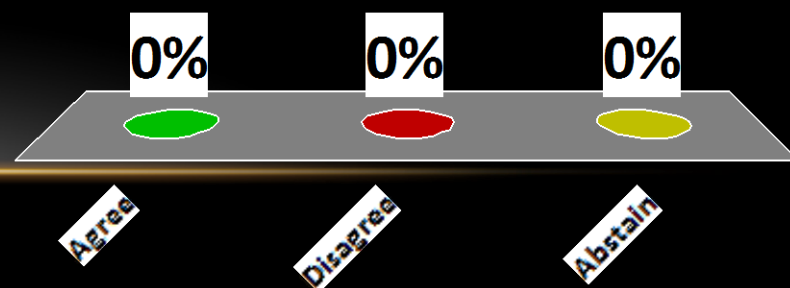


WG X

Question 6: Do useful classification systems (such as the Tsukayama classification) exist that may guide a surgeon in deciding on the appropriateness of I&D?

Consensus: The available classification system is inadequate in guiding a surgeon in selecting the appropriate surgical intervention for management of early PJI. There is a need for further studies to identify risk factors for failure of I&D in patients with acute PJI.

- A. Agree
- B. Disagree
- C. Abstain

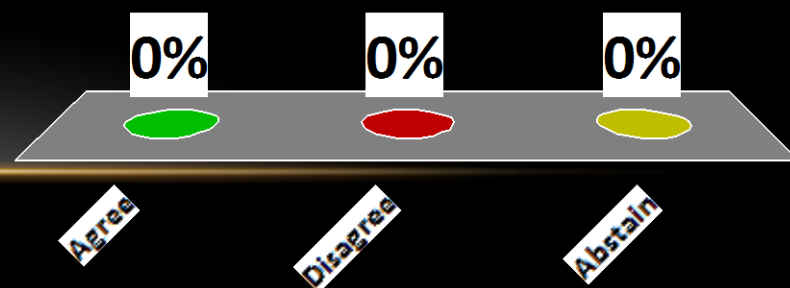


WG X

Question 7: Is I&D an emergency procedure or can the patient be optimized prior to the procedure? If so what needs to be optimized?

Consensus: No. I&D is not an emergency procedure in a patient without generalized sepsis. All efforts should be made to optimize the patients prior to surgical intervention.

- A. Agree
- B. Disagree
- C. Abstain

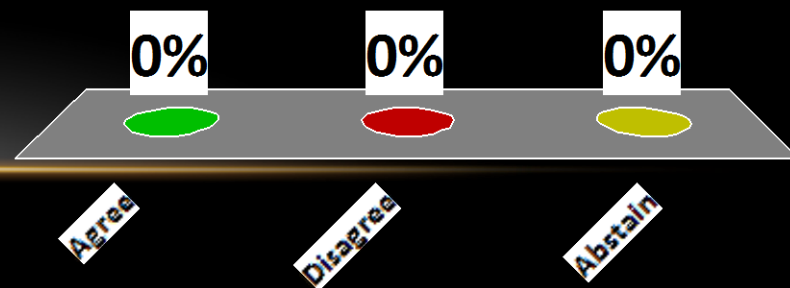


WG X

Question 8: Does arthroscopy have a role in I&D?

Consensus: Arthroscopy has no role in I&D of an infected joint.

- A. Agree
- B. Disagree
- C. Abstain

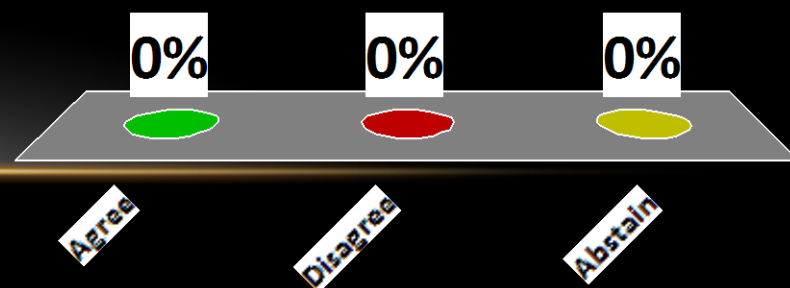


WG X

Question 9: How many I&Ds are reasonable before resection arthroplasty is considered?

Consensus: Following failure of one I&D, the surgeon should give consideration to implant removal.

- A. Agree
- B. Disagree
- C. Abstain

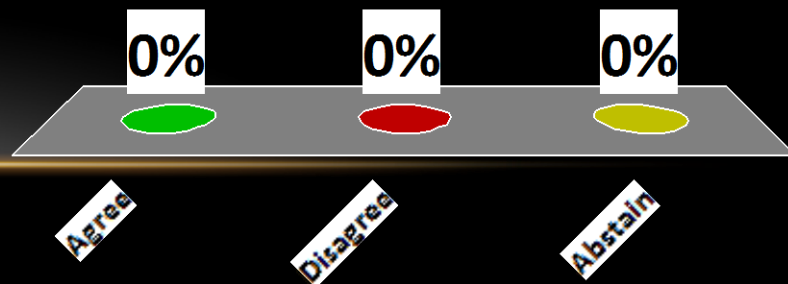


WG X

Question 10: Should culture samples be taken during I&D? If so how many and from where?

Consensus: Representative tissue and fluid samples, between 3 to 6, from the periprosthetic region should be taken during I&D.

- A. Agree
- B. Disagree
- C. Abstain

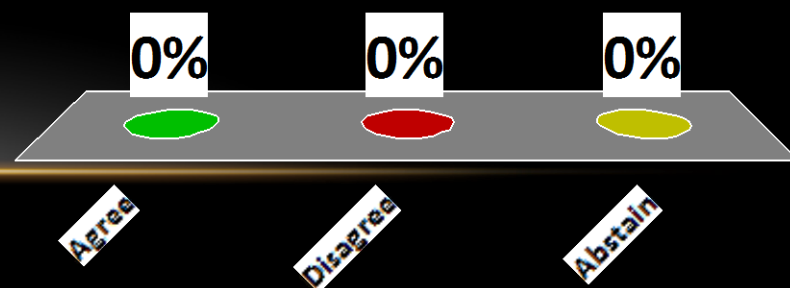


WG X

Question 11: Should extended antibiotic treatment be given to a patients following I&D? If so, what are the indications, type of antibiotic, dose and duration of treatment?

Consensus: No. Extended antibiotic should only be administered to patients that meet the criteria for PJI (see workgroup 7). The type, dose and duration of antibiotic treatment for infected cases should be determined in consultation with ID specialist.

- A. Agree
- B. Disagree
- C. Abstain

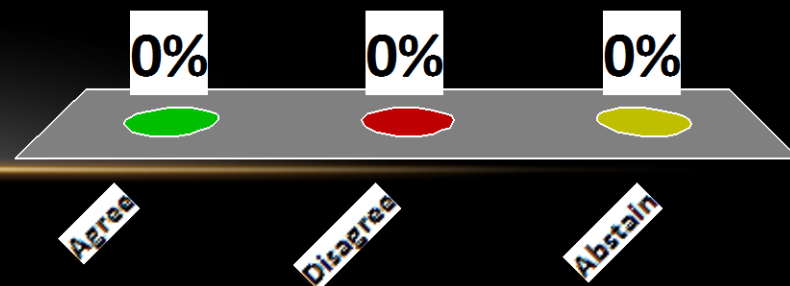


WG X

Question 12: Is there a role for intra-articular local antibiotic treatment after I&D? If so, define indications.

Consensus: No. There is inadequate evidence to support administration of continuous intra-articular antibiotic treatment for treatment of PJI.

- A. Agree
- B. Disagree
- C. Abstain

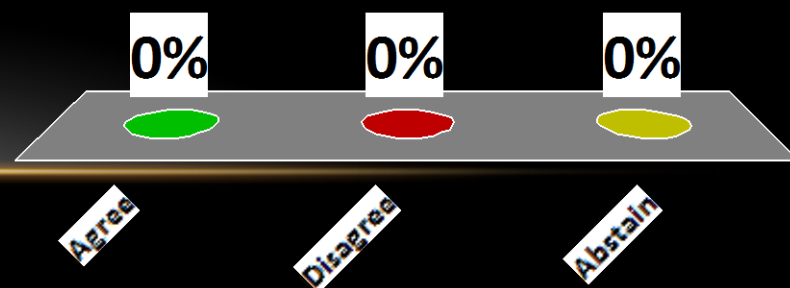


WG X

Question 13: Is there a role for the use of resorbable antibiotic-impregnated pellets (calcium sulfate, etc)? If so, define indications for use.

Consensus: No. Currently there is no conclusive evidence that the use of antibiotic-impregnated resorbable material improves the outcome of surgical intervention for I&D.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 11:

ANTIBIOTIC AND TIMING FOR REIMPLANTATION

Liaison: Camilo Restrepo MD

Leaders:

Remzi Tözün MD (International), Kevin Garvin MD, Steven Schmitt MD(US)

Delegates:

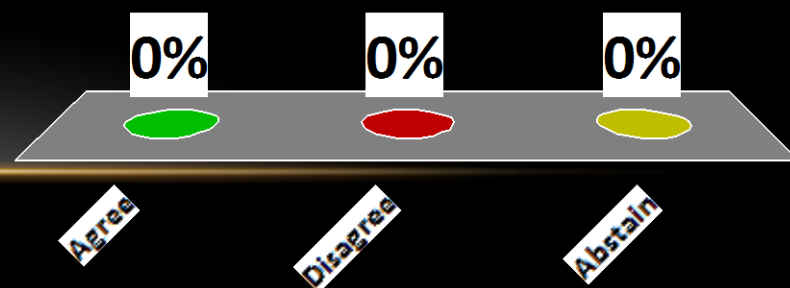
Bryan T. Alexander PharmD, Maja Babic MD, David Backstein MD, Kathy Belden MD, Aidin Eslam Pour MD, John L. Esterhai MD, Robert Good MD, Peter H. Jørgensen MD, Paul Lee MD, Claudio Mella MD, Camelia Marculescu MD, Carsten Perka MD, Harry E. Rubash MD, Tomoyuki Saito MD, Thomas Schmalzried MD, Rolando Suarez MD, Robert Townsend I. Michel P. J. Van den Bekerom MD

WG XI

Question 1: Can oral antibiotic therapy be used instead of intravenous for initial treatment of periprosthetic joint infection (PJI) following resection?

Consensus: Yes, there is evidence to support pathogen specific highly bioavailable oral antibiotic therapy as a choice for the treatment of PJI.

- A. Agree
- B. Disagree
- C. Abstain

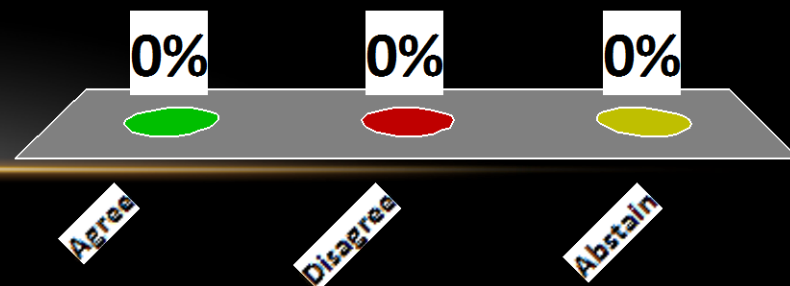


WG XI

Question 2: Is oral antibiotic therapy appropriate after an initial IV antibiotic course?

Consensus: Yes. There is evidence that pathogen specific highly bioavailable oral antibiotic therapy is an appropriate choice for the treatment of PJI after an initial IV antibiotic regimen.

- A. Agree
- B. Disagree
- C. Abstain

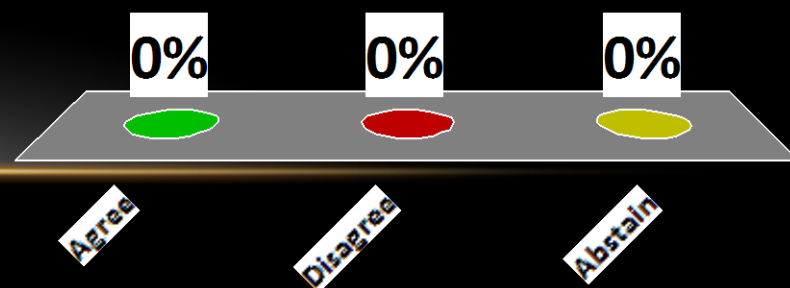


WG XI

Question 3: Which is the ideal length of antibiotic treatment following removal of the infected implant?

Consensus: There is no conclusive evidence regarding the ideal duration of antibiotic therapy. However, we recommend a period of antibiotic therapy between 4-6 weeks.

- A. Agree
- B. Disagree
- C. Abstain

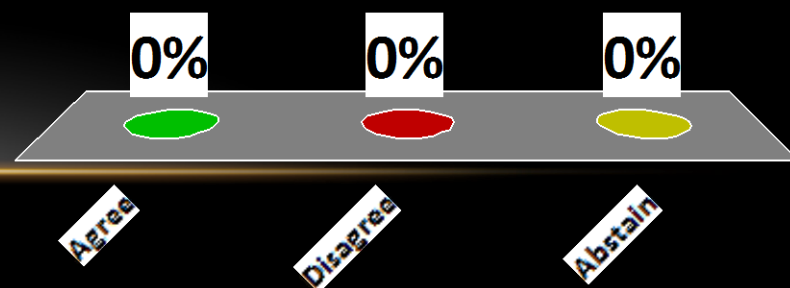


WG XI

Question 4: How should the length of antibiotic treatment be determined? (Inflammatory markers, clinical signs, etc).

Consensus: There is no conclusive evidence on how to determine the length of antibiotic therapy. A combination of clinical signs and symptoms and biochemical markers may be employed. There is need for a marker that can determine the optimal timing for reimplantation.

- A. Agree
- B. Disagree
- C. Abstain

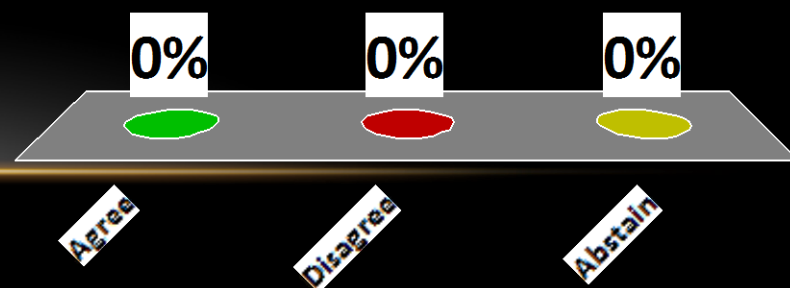


WG XI

Question 5: Should there be an antibiotic holiday period prior to reimplantation?

Consensus: There is no conclusive evidence supporting a holiday period following discontinuation of antibiotic treatment and prior to reimplantation surgery as a means of ensuring eradication of infection.

- A. Agree
- B. Disagree
- C. Abstain

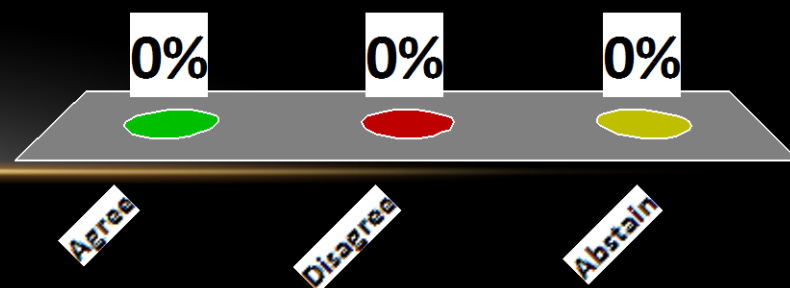


WG XI

Question 6: Does the use of rifampin in conjunction with IV antibiotic therapy following removal of the infected implant lead to a more rapid and definitive eradication of staphylococcal infection (particularly methicillin-resistant *Staphylococcus aureus* [MRSA])?

Consensus: No, there is no evidence to support the use of rifampin in conjunction with IV antibiotic therapy as a more adequate treatment option than either agent used alone in this clinical setting.

- A. Agree
- B. Disagree
- C. Abstain

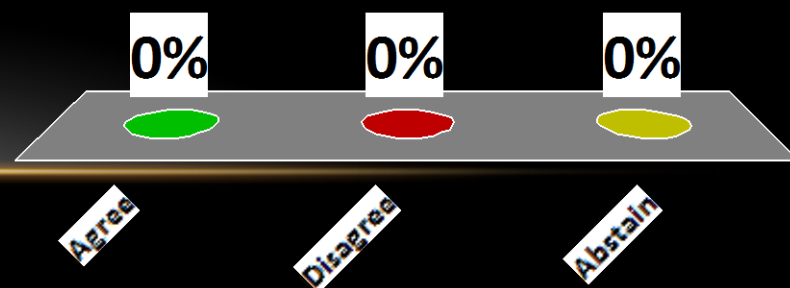


WG XI

Question 7: What is the optimal time to start rifampin treatment?

Consensus: There is no conclusive evidence regarding a best time to start rifampin treatment. Good oral intake and adequate administration of a primary antimicrobial agent should be well-established before starting rifampin. Potential side effects and drug interactions should be addressed prior to the start and at the conclusion of therapy.

- A. Agree
- B. Disagree
- C. Abstain

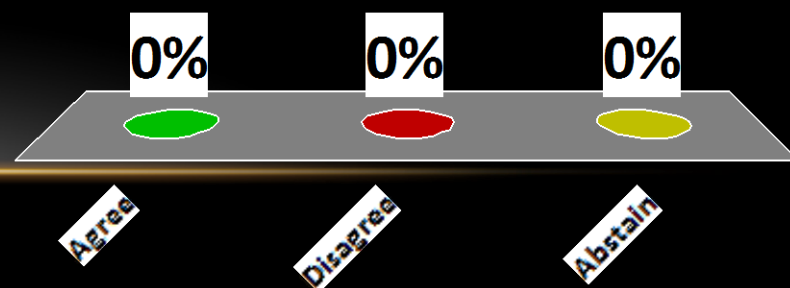


WG XI

Question 8: How long should antibiotic treatment be given following a single-stage exchange arthroplasty performed for PJI?

Consensus: There is no conclusive evidence regarding the ideal duration of antibiotic therapy for a single-stage exchange arthroplasty. We recommend that parenteral antibiotic be given for 2-6 weeks following single-stage exchange arthroplasty, with consideration for longer-term oral antibiotic therapy.

- A. Agree
- B. Disagree
- C. Abstain

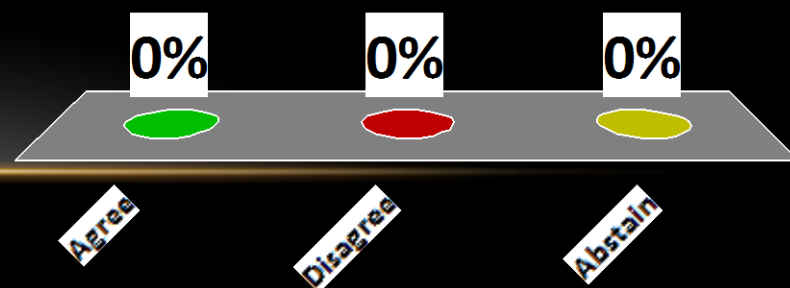


WG XI

Question 9: Is there a role for intra-articular local antibiotic treatment after reimplantation? If so, what are the indications?

Consensus: There is no conclusive evidence to support the use of intra-articular local antibiotic therapy. Further evidence is needed to support the use of intra-articular local antibiotic therapy.

- A. Agree
- B. Disagree
- C. Abstain

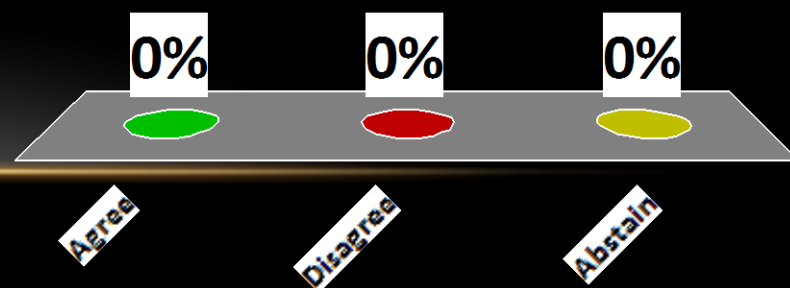


WG XI

Question 10: What is the optimal antibiotic treatment for culture-negative PJI?

Consensus: There is no conclusive evidence on the optimal antibiotic treatment for patients with culture-negative PJI. We recommend broad spectrum antibiotic regimen covering gram-negative and gram-positive infection (including MRSA), considering anaerobic coverage as well.

- A. Agree
- B. Disagree
- C. Abstain

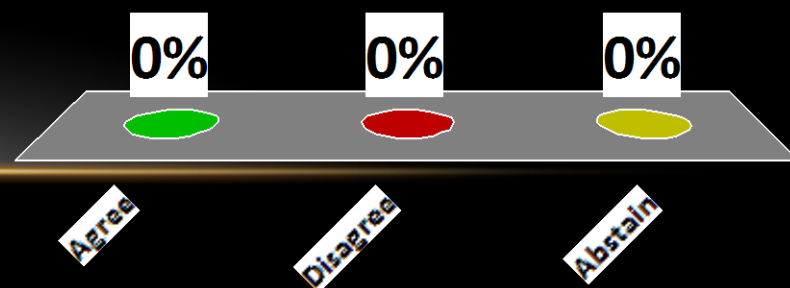


WG XI

Question 11: Is joint aspiration necessary prior to reimplantation?

Consensus: There is no conclusive evidence to support mandatory joint aspiration prior to reimplantation. It may be useful in selected cases. We recommend against infiltration of saline into the affected joint and reaspiration in patients with an initial dry aspirate.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 12:

ONE-STAGE VS TWO-STAGE EXCHANGE

Liaison: Paul Lichstein MD, MS

Leaders: Thorsten Gehrke MD (International), Adolph Lombardi MD, FACS (US), Carlo Romano MD (International), Ian Stockley MBBS, ChB, FRCS (International)

Delegates: George Babis MD, Jerzy Bialecki MD, László Bucsi MD, Xu Cai MD, Li Cao MD, Brian De Beuabien MD, Johannes Erhardt MD, Stuart Goodman MD, PhD, FRCSC, FACS, FBSE, William Jiranek MD, David Lewallen MD, MS, Paul Manner MD, Wojciech Marczyński MD, J Bohannon Mason MD, Kevin Mulhall MB, MCh, FRCSEd, Devdatt Neogi MS, DNB, Preetesh Patel MD, Francisco Piccaluga MD, Gregory Polkowski MD, Luis Pulido MD, Michael Ries MD, Wayne Paprosky MD, Juan Suarez MD, Fritz Thorey MD, Rashid Tikhilov MD, Job Diego Velazquez MD, Heinz Winkler MD

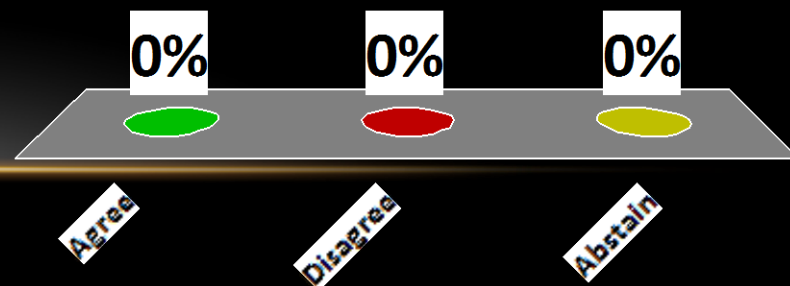
WG XII

Question 1: What are the indications and contraindications for one-stage exchange arthroplasty?

Consensus: One stage-exchange arthroplasty is a reasonable option for treatment of periprosthetic joint infection (PJI) in circumstances where effective antibiotics are available except in patients with systemic manifestations of infection (sepsis) in whom resection arthroplasty and reduction of bioburden may be necessary.

Relative contraindications to one-stage exchange may include lack of identification of an organism preoperatively, the presence of a sinus tract or severe soft tissue involvement that may lead to the need for flap coverage

- A. Agree
- B. Disagree
- C. Abstain

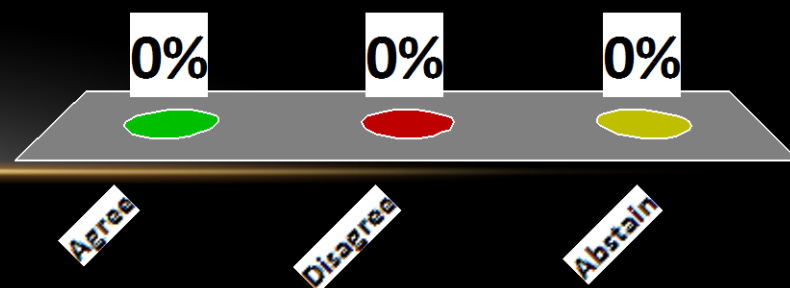


WG XII

Question 2: What are the indications and contraindications for two-stage exchange arthroplasty?

Consensus: Two stage-exchange arthroplasty is a reasonable option for treatment of periprosthetic joint infection (PJI). Specific conditions where two-stage exchange may be indicated include: 1) Patients with systemic manifestations of infection (sepsis) 2) presence of unknown organism or preoperative cultures identifying difficult to treat and antibiotic-resistant organisms, 3) presence of a sinus tract, 4) inadequate and non-viable soft tissue coverage

- A. Agree
- B. Disagree
- C. Abstain

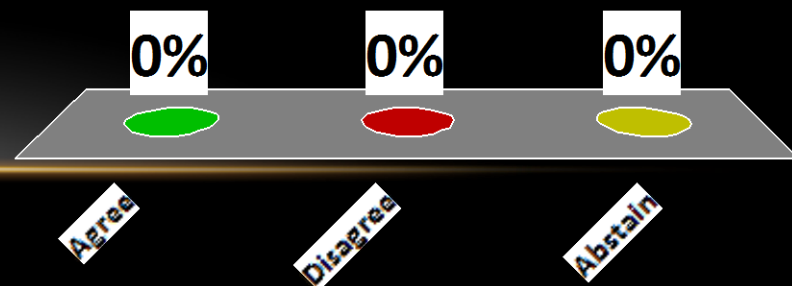


WG XII

Question 3: What is the optimal interval between two stages?

Consensus: There is no definitive evidence in the literature as to the optimal time interval between the two stages, with reports varying from 2 weeks to several months.

- A. Agree
- B. Disagree
- C. Abstain



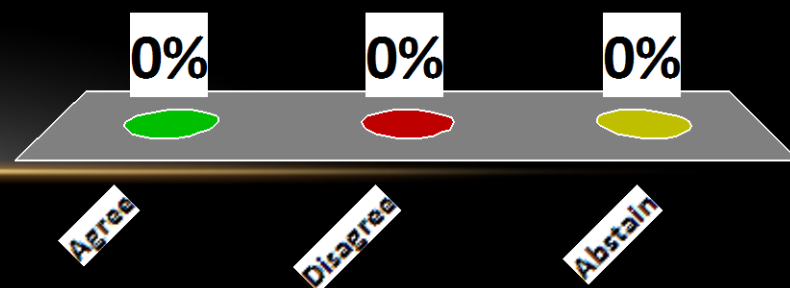
WG XII

Question 4: Is there a difference in cost between one-stage and two-stage exchange arthroplasty?

Consensus: Due to the lack of knowledge about the real costs and the absence of comparative studies we are not able to give a clear statement.

If infection is effectively treated without the need for reoperation, one-stage exchange arthroplasty is less expensive than two-stage exchange. Further studies are required.

- A. Agree
- B. Disagree
- C. Abstain

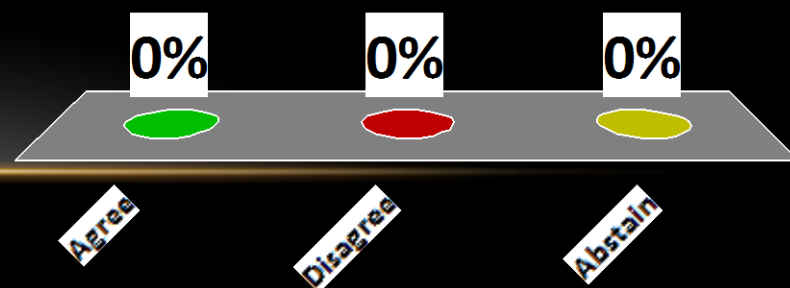


WG XII

Question 5: How many septic exchanges should be attempted in patients?

Consensus: There is no definitive evidence that supports limiting the number of septic exchanges that should be attempted. Reimplantation is appropriate if the infection is adequately controlled following repeat resection, the patient is able to tolerate additional surgery, and there is the ability to functionally reconstruct and there is adequate soft tissue coverage.

- A. Agree
- B. Disagree
- C. Abstain

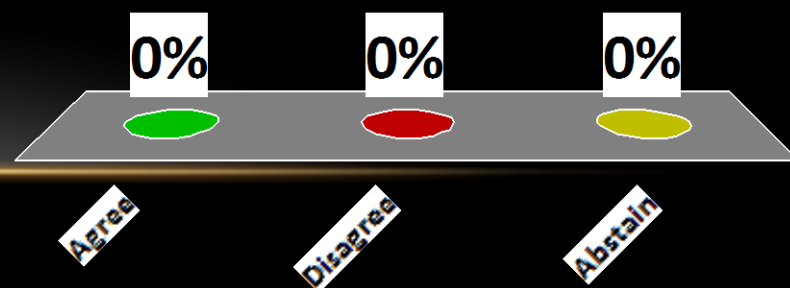


WG XII

Question 6 : What are the indications for knee arthrodesis?

Consensus: The literature is deficient in providing guidance on this issue. Knee arthrodesis may be an appropriate option for patients who have failed multiple attempts at reconstruction and stand an unacceptably high risk of recurrent infection with repeat arthroplasty procedures and / or has a deficient extensor mechanism. The choice between arthrodesis and amputation needs to take into account the clinical situation of the individual and patient preference.

- A. Agree
- B. Disagree
- C. Abstain

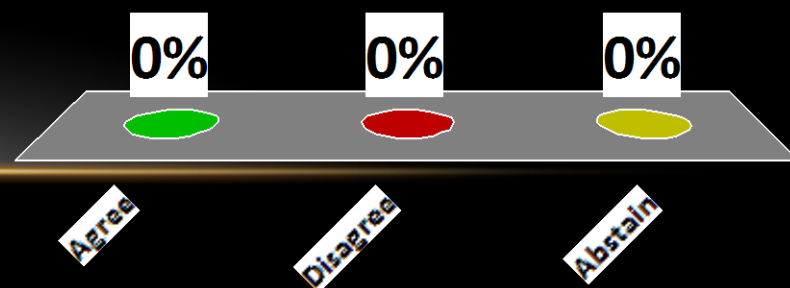


WG XII

Question 7: If knee arthrodesis is planned for a chronically infected joint, should this be performed in a single stage or two stages?

Consensus: Knee arthrodesis may be performed as one stage or two stage, but the decision depends on the individual circumstances and the host factors.

- A. Agree
- B. Disagree
- C. Abstain

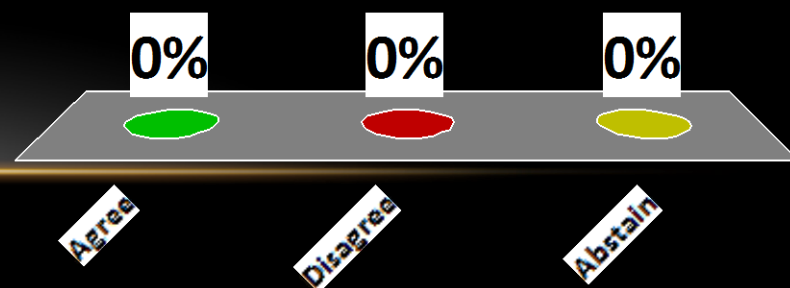


WG XII

Question 8: What are the indications for amputation?

Consensus: Amputation for treatment of PJI affecting the knee or the hip may be appropriate in selected cases involving a non-ambulatory patient, necrotizing fasciitis resistant to aggressive debridement, severe bone loss that precludes arthrodesis (knee), inadequate soft tissue coverage, and multiple failed attempts at staged exchange and resection arthroplasty, or peripheral vascular disease and neurovascular injury.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 13:MANAGEMENT OF FUNGAL OR ATYPICAL PERIPROSTHETIC JOINT INFECTION

Liaison: Matthias Gebauer MD

Leaders:

Lars Frommelt (International), Judith O'Donnell (US)

Delegates:

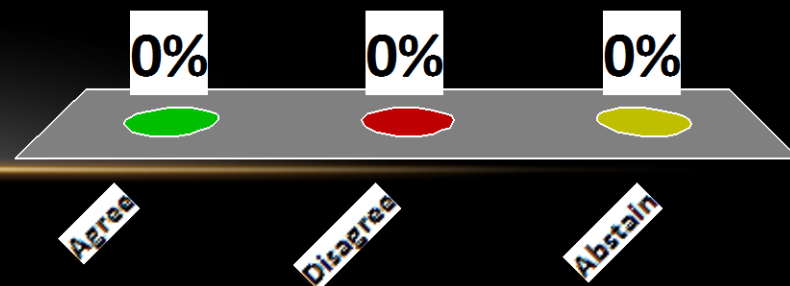
Pramod Achan MBBS, Tim N Board MD, Janet Conway, T Dalen, Richard Evans, William Griffin MD, Nima Heidari MBBS, Michael Hirschmann, Glenn Kerr MD, Alex McLaren MD, Sandra Bliss Nelson MD, Marc Nijhof, Stafan Winkler MD, Akos Zahar MD, Yong Gang Zhou

WG XIII

Question 1: What is the definition of fungal or atypical periprosthetic joint infection (PJI)?

Consensus: A fungal or atypical PJI is an infection of a joint arthroplasty caused by fungi or atypical bacteria.

- A. Agree
- B. Disagree
- C. Abstain

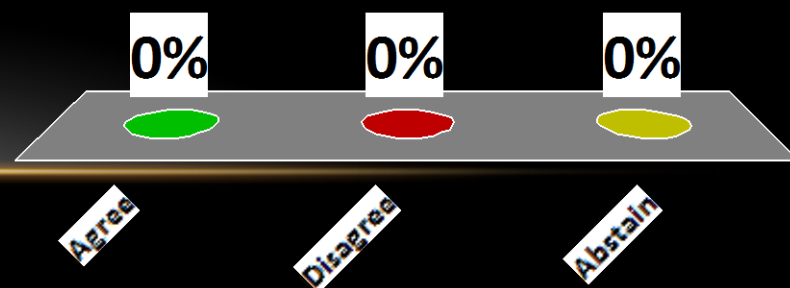


WG XIII

Question 2: When should fungal organisms be considered as a cause of PJI?

Consensus: A PJI caused by fungi can be considered if fungal pathogens are isolated from periprosthetic tissue cultures or joint aspirations in a patient who has other signs or symptoms of PJI, such as abnormal serology and joint aspiration parameters (neutrophil count and differential). If clinical symptoms raise suspicion for a fungal PJI, repeated joint aspiration may be needed to isolate the infecting organism.

- A. Agree
- B. Disagree
- C. Abstain

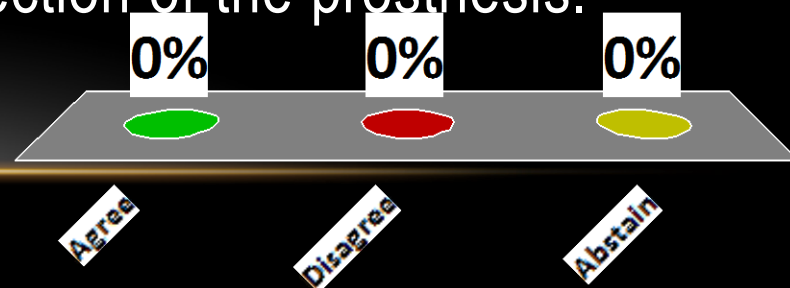


WG XIII

Question 3: Which host factors (concomitant disease and other factors) predispose to fungal PJI?

Consensus: Predisposing host factors to fungal PJI are: decreased cellular immunity, immunosuppression, neutropenia, malignancy, antineoplastic agents, corticosteroids or other immunosuppressive drugs, drug abuse, prolonged use of antibiotics, presence of indwelling catheters (intravenous, urinary or parenteral hyperalimentation), diabetes mellitus, malnutrition, rheumatoid arthritis, history of multiple abdominal surgeries, history of renal transplantation, severe burns, acquired immunosuppressive disease, tuberculosis, and preceding bacterial infection of the prosthesis.

- A. Agree
- B. Disagree
- C. Abstain

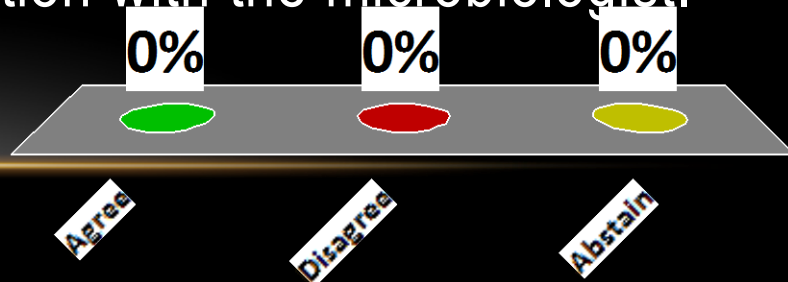


WG XIII

Question 4: When fungal organisms are considered, what specimens should be collected and additional diagnostic tools should be used and how should they be processed to optimize diagnosis?

Consensus: Fungal selective media must be included and it should be observed that prolonged culture may be required. In specific cases we should expand our diagnostic testing to include tissue samples for histological examination, especially in cases where there is a high index of clinical suspicion. Resistance of *Candida* species to fluconazol has been reported in the literature and so susceptibility testing should be performed, in collaboration with the microbiologist.

- A. Agree
- B. Disagree
- C. Abstain

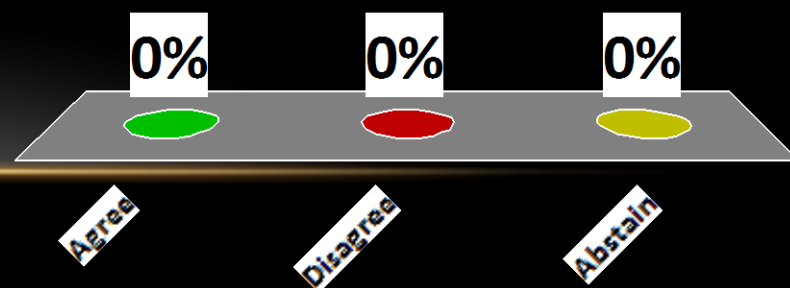


WG XIII

Question 5: What is the best way to surgically manage fungal PJI: irrigation and debridement, one-stage exchange, two-stage exchange, or permanent resection arthroplasty?

Consensus: On the basis of the current literature, two-stage exchange arthroplasty is the recommended treatment option to manage fungal PJI. However, the success rate is lower than that of bacterial cases.

- A. Agree
- B. Disagree
- C. Abstain

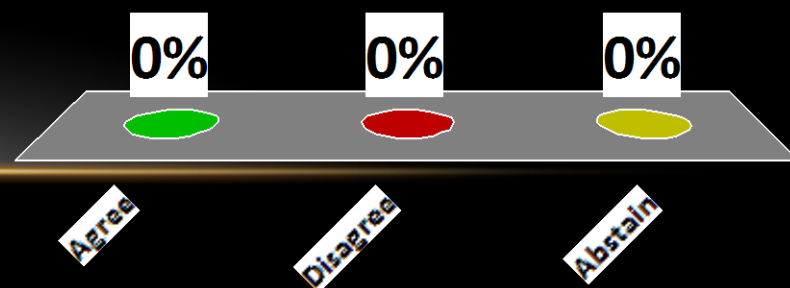


WG XIII

Question 6: What are the optimal systemic antifungals administered(type and dose) in the treatment of fungal PJI?

Consensus: Well-established agents for a systemic treatment are the azols and amphotericin products given either orally or intravenously for a minimum of 6 weeks. Resistance of *Candida* species to fluconazol has been reported in the literature and so susceptibility testing should be performed, in collaboration with the microbiologist.

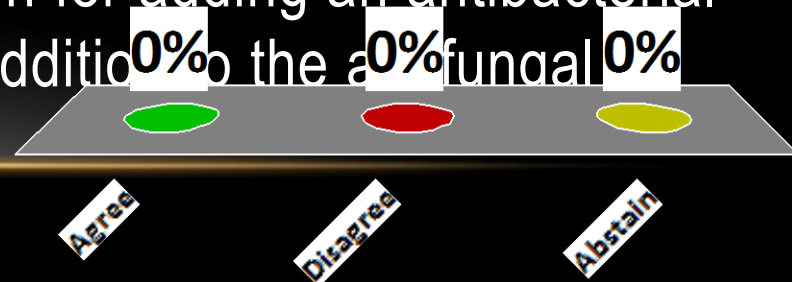
- A. Agree
- B. Disagree
- C. Abstain



WG XIII

Question 7: When treating fungal PJIs in a staged fashion, which antifungal or antibacterial medications should be used for the cement spacer? What is the recommended dose?

Consensus: Recent literature confirms that antifungal agents are released in high amounts for local delivery, but there are no clinical studies yet to document the clinical effectiveness. The use of liposomal amphotericin B, loaded in bone cement, has more than an order of magnitude greater than release of conventional amphotericin B deoxycholate. There is also controlled release data for azol antifungals, with specific data on the elution of voriconazol from bone cement. There should be a consideration for adding an antibacterial to the bone cement for local delivery in addition to the antifungal.

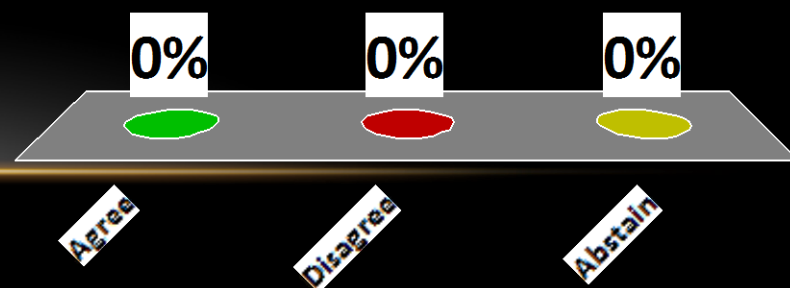


WG XIII

Question 8: Which investigations are recommended to monitor fungal PJI and determine timing of reimplantation ?

Consensus: C-reactive protein and erythrocyte sedimentation rate are recommended to monitor fungal PJI. There is no clear evidence for the timing of reimplantation based on laboratory tests.

- A. Agree
- B. Disagree
- C. Abstain

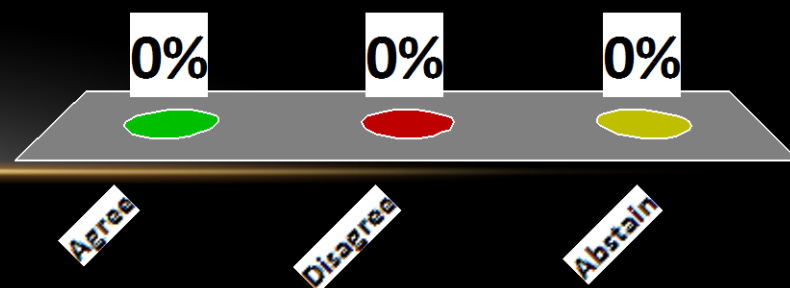


WG XIII

Question 9: What is the duration for systemic antimicrobial (antifungal) agent administration in the treatment of fungal PJI?

Consensus: Systemic antimicrobial (antifungal) agent administration in the treatment of fungal PJI should be started at the time of removal of the implants (stage one) and continued for at least 6 weeks. It should then be stopped before reimplantation (stage two) the timing of which is based on clinical judgement and laboratory tests. There are no good data to support antifungal agent administration after reimplantation.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 14: ORAL ANTIBIOTIC THERAPY

Liaison: Patrick O'Toole MD

Leaders:

Douglas Osmon MD (US), Alex Soriano DO (International)

Delegates:

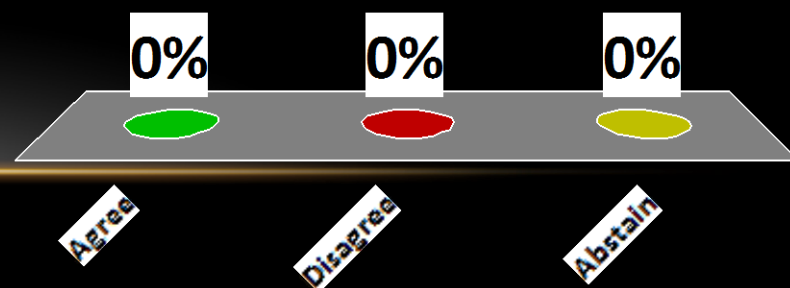
Elie F Berbari MD, Jan-Erik Berdal MD, Mathias Bostrum, Rafael Franco MD, DeYoung Huang PhD, Mark Lazarus MD, Charles Nelson, F Nishisaka, Ryan Nunley, Brian Roslund, Cassandra D Salgado, Robert Sawyer MD, John Segreti MD, Eric Senneville PhD, Xian Long Zhang

WG XIV

Question 1: What are the appropriate oral antibiotic or antibiotic combinations following adequate surgical treatment for acute (early or late) PJI in which the implant has been retained?

Consensus: In acute PJI, open debridement and implant retention is associated with a wide variation in success rates. The reasons for this discrepancy include: 1) characteristics of the patients, 2) surgical technique including the exchange of modular polyethylene liner, and 3) the type of antibiotic or combination of antibiotics administered, especially within the first month after debridement.^{1,2}

- A. Agree
- B. Disagree
- C. Abstain

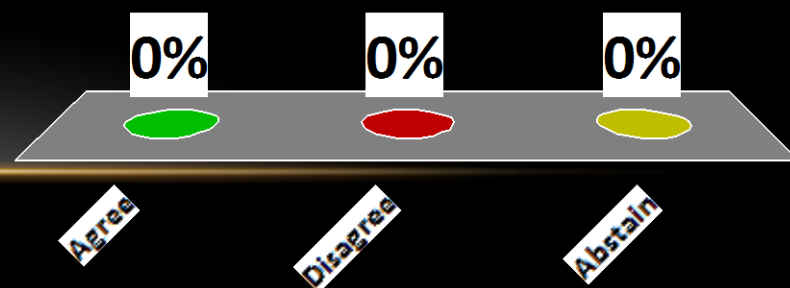


WG XIV

Question 2: How long should antibiotic treatment in acute PJI treated with debridement and retention of the implant be?

Consensus: The duration of intravenous and oral treatment is a question that remains unsolved and there is no clinical trial comparing different durations of antibiotic treatment.

- A. Agree
- B. Disagree
- C. Abstain

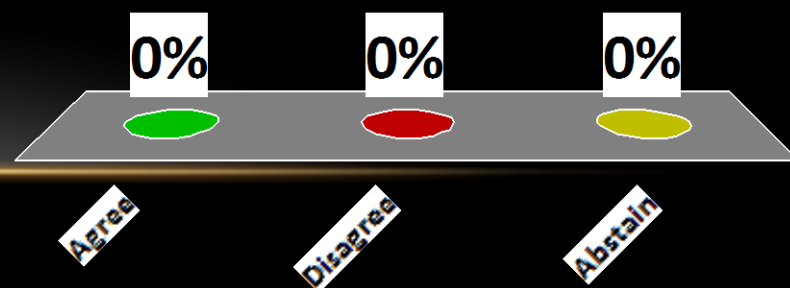


WG XIV

Question 3: What is the role of antibiotic or antibiotic combinations for treatment of PJI managed without adequate surgical intervention?

Consensus: The authors do not recommend the management of PJI only with antibiotics or with antibiotics and open debridement without removing the implant in chronic PJI.

- A. Agree
- B. Disagree
- C. Abstain

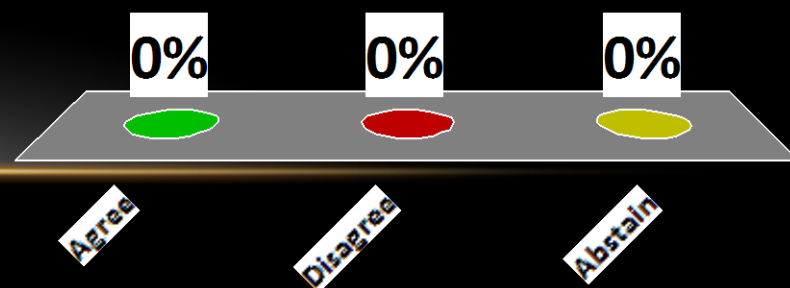


WG XIV

Question 4: How long should suppressive therapy be administered?

Consensus: There is no consensus about the length of time that patients should receive suppressive antibiotic therapy. Further research is needed.

- A. Agree
- B. Disagree
- C. Abstain

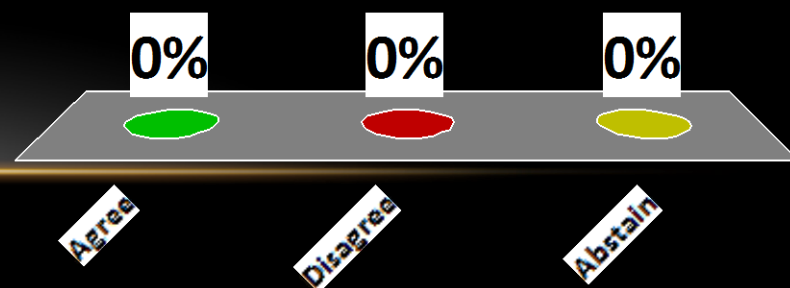


WG XIV

Question 5: List of antibiotics that could be useful for suppressive treatment based on type of organism.

Consensus: There is no consensus regarding appropriate antibiotics for suppression therapy. The antibiotic should be chosen according to the susceptibility pattern of the isolated microorganism, preferably obtained from deep samples by joint puncture or surgical debridement.

- A. Agree
- B. Disagree
- C. Abstain



WORKGROUP 15: PREVENTION OF LATE PJI

Liaison: **Antonia Chen MD, MBA**

Leaders:

**Fares Haddad Mb, ChB, FRCS (International), Paul Lachiewicz MD (US),
Richard O'Donnell MD (US)**

Delegates:

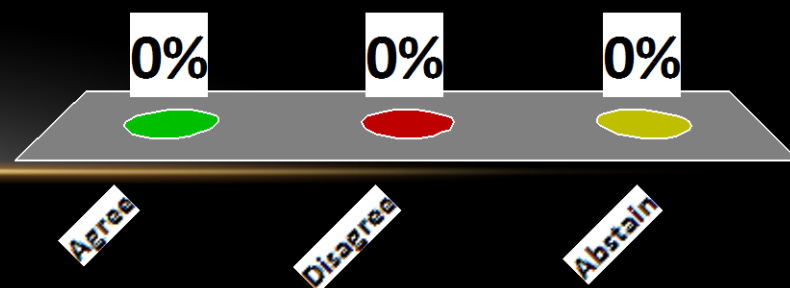
Michael Bolognesi MD, Luis F Calixto MD, Luis E Cortes MD, Alejandro Gonzalez Della Valle MD, Massimo Franceschini MD, Jiri Gallo MD, Aaron Glynn MD, Michael Huo MD, Aydin Kahramanov MD, Monti Khatod MD, Stergios Lazarinis MD, Guenther Lob MD, Robert S Namba MD Arvind Nana MD, Peter Ochsner MD, Vincent Pellegrini MD, Neil Sheth MD, Ibrahim Tuncay MD, Tobias Winkler MD, Yiaoping Wu MD, LiRong Zeng MD

WG XV

Question 1: What are the risk factors for late periprosthetic joint infection (PJI)?

Consensus: Late PJI can be defined as a PJI that develops at a variable length of time, usually 4-8 weeks after an index procedure. The late PJI occurs after an initially successful index procedure with no clinical or radiographic signs of PJI. Risk factors for late PJI is focused on immunosuppressed or immunocompromised patients.

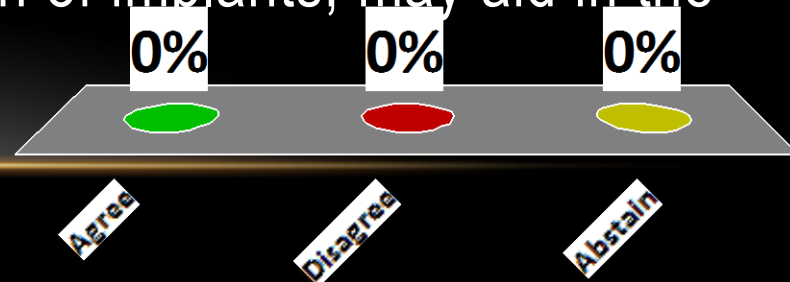
- A. Agree
- B. Disagree
- C. Abstain



WG XV

Question 2: Which diagnostic procedures have to be done to verify late PJI?

Consensus: Any clinical signs of infection, including pain, swelling, fever, erythema, and warmth around the joint should raise the suspicion for a late PJI.²⁰ Preoperative diagnostic procedures, including measuring erythrocyte sedimentation rate (ESR), measuring C-reactive protein (CRP), aspiration of the joint (leukocyte count, neutrophil differentiation, and cultures), obtaining tissue samples, and performing nuclear medicine imaging, may be performed to aid in the diagnosis of late PJI. Intraoperative diagnostic procedures, such as culturing of tissue samples and sonication of implants, may aid in the diagnosis of late PJI.

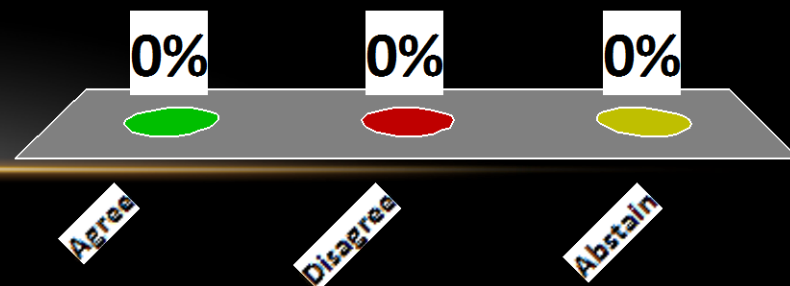


WG XV

Question 3: Does the type, dose, and length of anticoagulation for prophylaxis influence the incidence of SSI following TJA?

Consensus: This question should be moved under the immediate postoperative period for consideration in early PJI, not late PJI.

- A. Agree
- B. Disagree
- C. Abstain

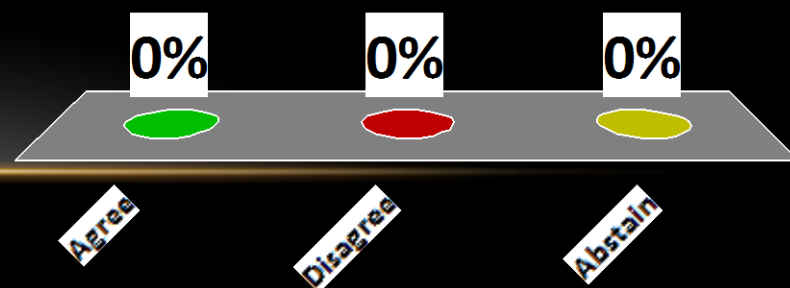


WG XV

Question 4: Should a patient with TJA be given dental antibiotic prophylaxis?

Consensus: The use of dental antibiotic prophylaxis in patients with TJA should be individualized, based on patient risk factors and the complexity of the dental procedure to be performed.

- A. Agree
- B. Disagree
- C. Abstain

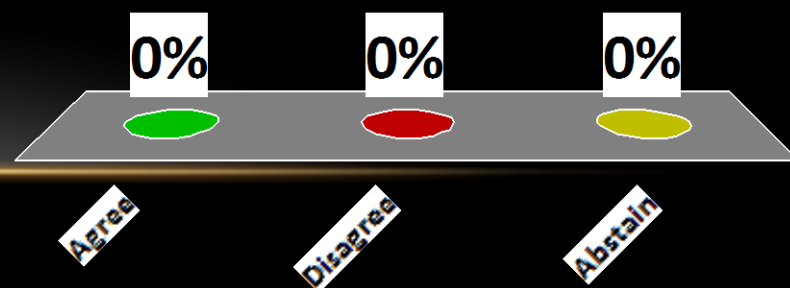


WG XV

Question 5: Should patients at high risk of late PJI be given prophylactic antibiotics during viral illnesses?

Consensus: There is no role for administration of oral antibiotics to patients with TJA who develop viral illnesses.

- A. Agree
- B. Disagree
- C. Abstain

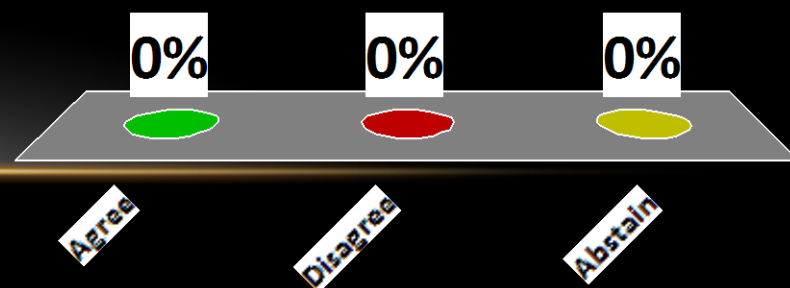


WG XV

Question 6: Can transient bacteremia be minimized during minor surgical procedures (eg, colonoscopy or cystoscopy) to prevent late PJI?

Consensus: The influence of transient bacteremia can be minimized during minor surgical procedures by administering prophylactic antibiotics to individualized patient and especially to high-risk patients.

- A. Agree
- B. Disagree
- C. Abstain

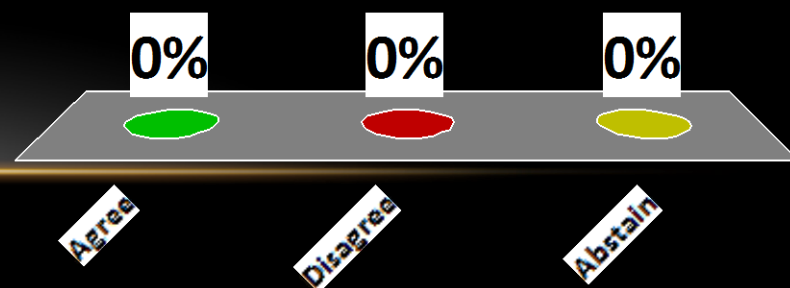


WG XV

Question 7: What is the role of herbal supplements, probiotics, and alternative medicine in decreasing translocation of bacteria across the intestinal wall?

Consensus: There is insufficient evidence to use the use of herbal supplements, probiotics, and alternative medicine to decrease translocation of bacteria across the intestinal wall to prevent late PJI.

- A. Agree
- B. Disagree
- C. Abstain

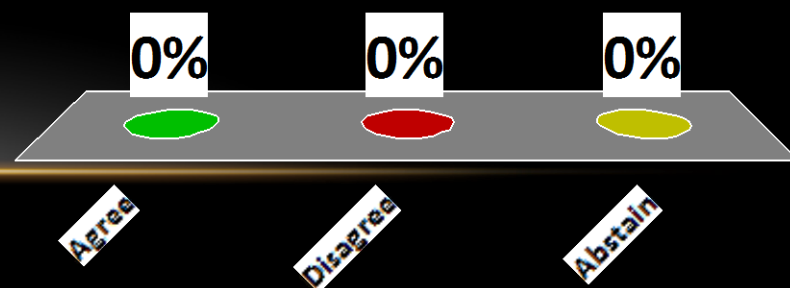


WG XV

Question 8: Is there a role for post-surgical monitoring of MRSA colonization in the asymptomatic patient?

Consensus: We recommend against post-surgical monitoring of MRSA colonization in the asymptomatic patient.

- A. Agree
- B. Disagree
- C. Abstain

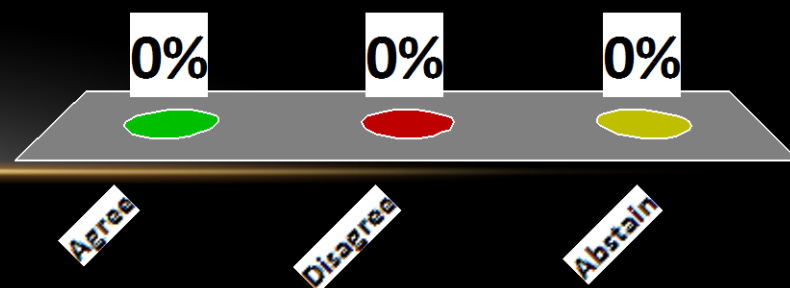


WG XV

Question 9: What are the methods to identify extra-articular sources of late PJI?

Consensus: Extra-articular sources that contribute to late PJI should be identified by obtaining history, doing a physical exam, performing laboratory testing, and imaging suspected areas of infection.

- A. Agree
- B. Disagree
- C. Abstain

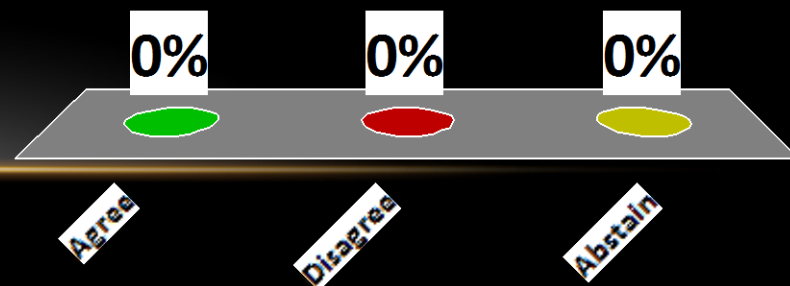


WG XV

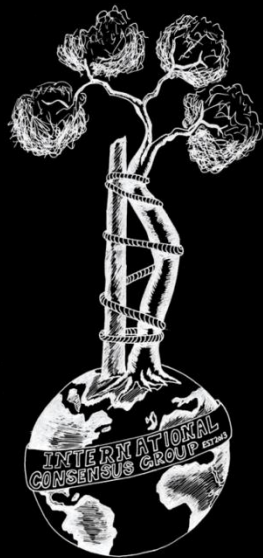
Question 10: When should further workup for postoperative fevers be performed after TJA?

Consensus: This question should be moved under the immediate postoperative period for consideration in early PJI, not late PJI.

- A. Agree
- B. Disagree
- C. Abstain



Welcome



INTERNATIONAL
CONSENSUS MEETING

WG III

Revisions



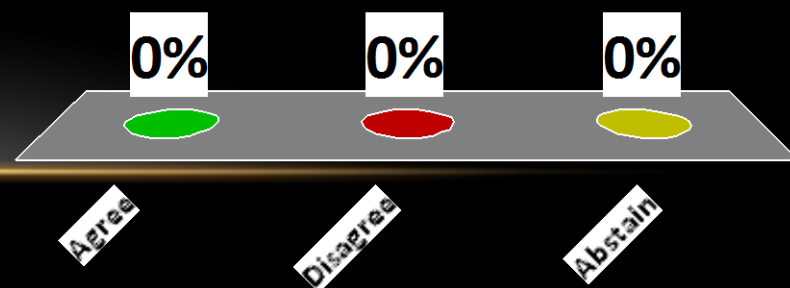
INTERNATIONAL CONSENSUS MEETING

WG III

Question 16A: What type of perioperative antibiotic prophylaxis is recommended for current MRSA carriers?

Consensus: For current MRSA carriers, vancomycin or teicoplanin is the recommended perioperative antibiotic prophylaxis.

- A. Agree
- B. Disagree
- C. Abstain

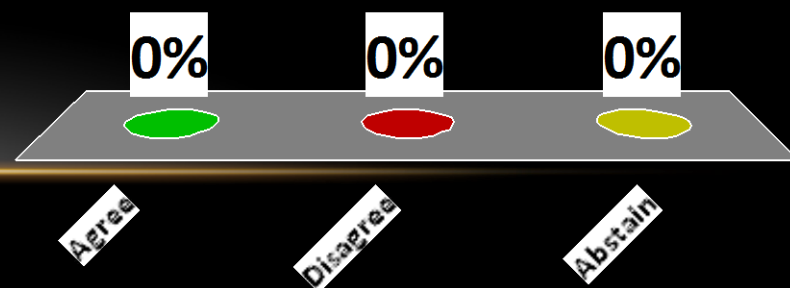


WG III

Question 16B: Should patients with prior history of MRSA be re-screened? What should the choice of perioperative prophylactic antibiotics be in these patients?

Consensus: Patients with prior history of MRSA should be re-screened. If patients are found to be negative for MRSA, we recommend routine perioperative antibiotic prophylaxis.

- A. Agree
- B. Disagree
- C. Abstain

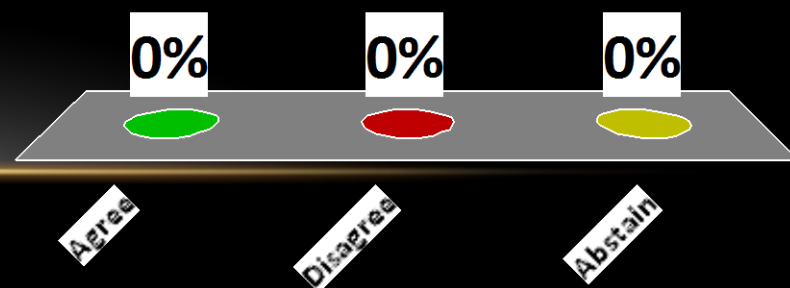


WG III

Question 18: Should antibiotic prophylaxis be different in patients who have reconstruction by bulk allograft?

Consensus: We recommend the use of routine antibiotic prophylaxis in patients who have reconstruction by bulk allograft.

- A. Agree
- B. Disagree
- C. Abstain

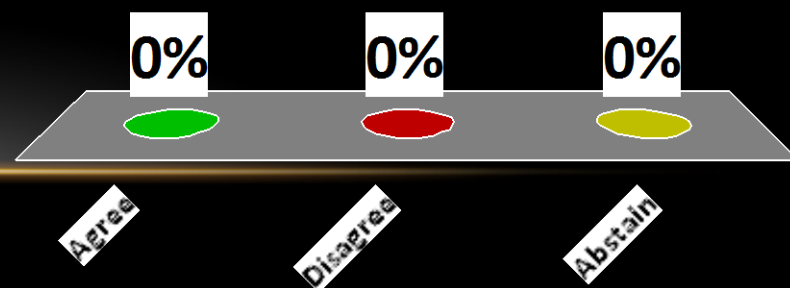


WG III

Question 19: Do patients with poorly controlled diabetes immunosuppression, or autoimmune disease require a different perioperative antibiotic prophylaxis?

Consensus: No. Routine antibiotic prophylaxis is recommended.

- A. Agree
- B. Disagree
- C. Abstain



WG V

Revisions



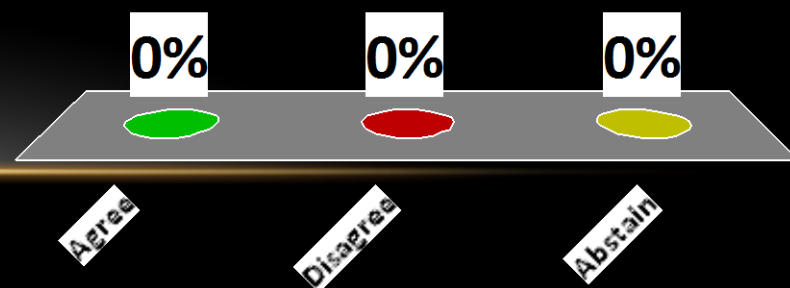
INTERNATIONAL CONSENSUS MEETING

WG V

Question 8: What is the role for blood salvage (intraoperative and postoperative) during second stage of two-stage exchange arthroplasty for treatment of PJI?

Consensus: The role of blood salvage (intraoperative and postoperative) during the second stage exchange arthroplasty is inconclusive. Blood salvage should be utilized with caution.

- A. Agree
- B. Disagree
- C. Abstain



WG XIV

Revisions



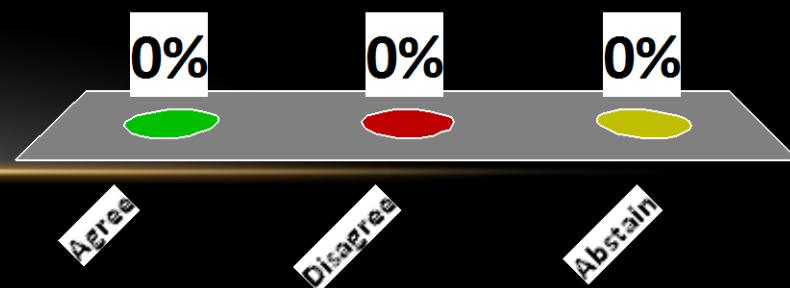
INTERNATIONAL CONSENSUS MEETING

WG XIV

Question 1: What are the appropriate oral antibiotic or antibiotic combinations following adequate surgical treatment for acute (early or late) PJI in which the implant has been retained?

Consensus: In acute PJI, open debridement and implant retention is associated with a wide variation in success rates. The reasons for this discrepancy include: 1) characteristics of the patients, 2) surgical technique including the exchange of modular polyethylene liner, and 3) the type of antibiotic or combination of antibiotics administered, especially within the first month after debridement.^{1,2}

- A. Agree
- B. Disagree
- C. Abstain

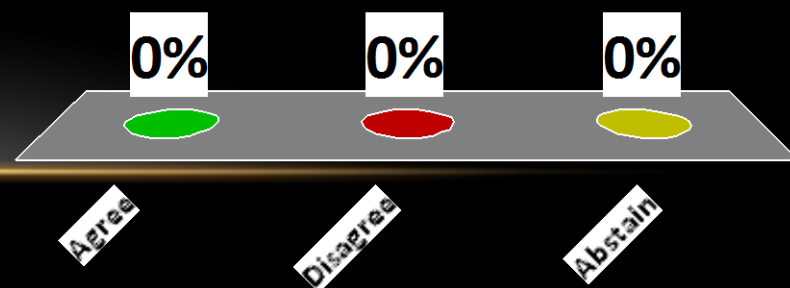


WG XIV

Question 5: List of antibiotics that could be useful for suppressive treatment based on type of organism.

Consensus: There is no consensus regarding appropriate antibiotics for suppression therapy. The antibiotic should be chosen according to the susceptibility pattern of the isolated microorganism, preferably obtained from deep samples by joint puncture or surgical debridement.

- A. Agree
- B. Disagree
- C. Abstain



WG XV

Revisions



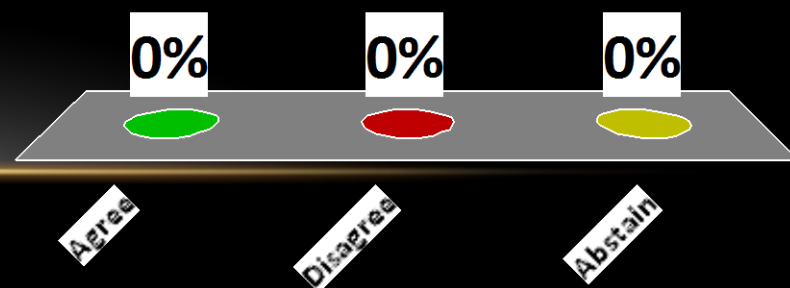
INTERNATIONAL CONSENSUS MEETING

WG XV

Question 10: When should further workup for postoperative fevers be performed after TJA?

Consensus: This question should be moved under the immediate postoperative period for consideration in early PJI, not late PJI.

- A. Agree
- B. Disagree
- C. Abstain



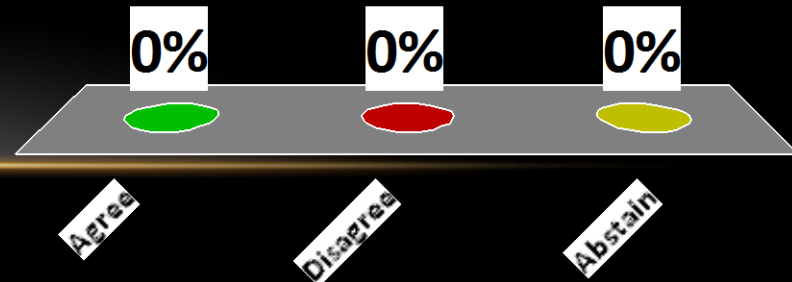
Bonus Questions



INTERNATIONAL CONSENSUS MEETING

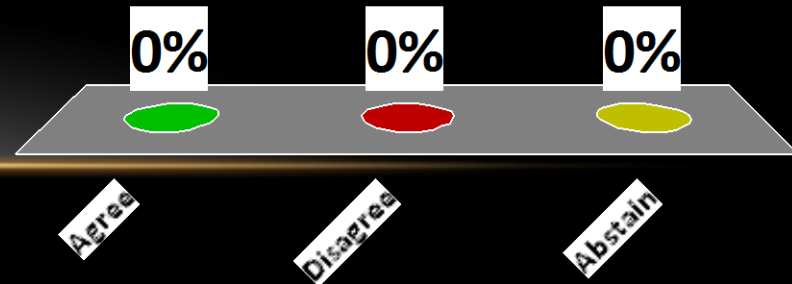
Which of the following represents your specialty?

- A. Orthopaedic surgeon
- B. Infectious disease
- C. Musculoskeletal pathology
- D. Musculoskeletal radiology/nuclear medicine
- E. Rheumatology
- F. General Surgery
- G. Governmental agencies



If you are a an orthopedic surgeon, how many infections do you treat per year?

- A. Less than 10
- B. Between 10-50
- C. Between 50-100
- D. Greater than 100



Do you believe patients with PJI should be treated in “Special Centers”?

A. Yes

B. No

