Authors: Bryan D. Springer, Per ,ÅkessonQiaojie Wang, Michael Geary

QUESTION 3: After a patient undergoes methicillin-resistant *Staphylococcus aureus* (MRSA) decolonization, is there a need to re-screen the patient?

RECOMMENDATION: We recognize that a subset of MRSA carriers remains colonized despite preoperative decolonization protocols. Currently, there is no evidence to suggest that re-screening and subsequent repeated MRSA decolonization can change the perioperative prophylactic antibiotic regimen and reduce the risk of periprosthetic joint infection (PJI) further.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 87%, Disagree: 8%, Abstain: 5% (Super Majority, Strong Consensus)

RATIONALE

Colonization with both methicillin-sensitive *Staphylococcus aureus* (MSSA) and MRSA increases the risk of staphylococcal surgical site infections after elective hip and knee arthroplasty [1,2]. In the United States, an estimated 0.6 to 6% of the population are nasal carriers of MRSA [1,3]. For identified carriers of MRSA undergoing hip and knee arthroplasty, standard practice includes decolonization prior to surgery followed by perioperative vancomycin for MRSA coverage.

Previous studies have proven that a protocol of screening and decolonization of MRSA among total joint arthroplasty (TJA) candidates is highly successful in reducing the percentage of MRSA carriers [1,4–8]. However, controversy continues with regard to the ability of *S. aureus* decolonization protocols to reduce the prevalence of surgical site infections (SSIs) and PJIs in patients undergoing total hip or knee arthroplasty. In a meta-analysis of four studies [9], the use of a prophylaxis protocol for MRSA decolonization reduced SSI cases by approximately 39%. Another meta-analysis of 19 studies [10] suggested a decrease in the rates of SSI with decolonization. However, five of the included studies did not reach significance and were underpowered. Baratz et al. [11] retrospectively described 3,434 patients who underwent elective primary and revision hip and knee arthroplasty over a two year period. Despite successfully obtaining a 78% MRSA decolonization rate at the day of surgery, the incidence of SSI was not decreased compared to an historical control group.

Several studies have re-screened patients on the day of surgery and identified persistent MRSA carriage in as many as 20% of patients, despite preoperative decolonization protocols [8,11,12]. Similarly, MRSA carriers that have been decolonized and later re-screened for future procedures have shown recolonization rates as high as 38% [13,14]. However, no studies have specifically investigated whether persistent MRSA carriage is associated with an increased risk for SSI compared to previous MRSA carriers who remain decolonized. Furthermore, the cost-effectiveness of re-screening and repeated decolonization of MRSA is another important issue to be considered. Slover et al. estimated that the cost of a revision total hip or knee arthroplasty secondary to infection to be $70,000 [15]. The authors then estimated that a screening and decolonization program needed to result in a 35% reduction in revision rates to be cost-effective [15]. More importantly, extended mupirocin use has been shown to increase the risk of mupirocin resistance in MRSA carriers [16].

An important question is whether re-screening a previously identified MRSA carrier will change the clinical management during current and future elective orthopaedic procedures. For nearly all patients with any history of MRSA colonization, the perioperative antibiotic regimen will include vancomycin, regardless of their most recent colonization status. For certain hospital policies, identifying persistent MRSA colonization on the day of surgery may prompt inpatient contact precautions, while those who have been successfully decolonized may not require contact precautions. It is unknown what effect, if any, these perioperative protocols have on rates of surgical site infections.

The cohort most likely to benefit from re-screening are MSSA carriers and previously non-colonized patients after a certain period of time from the initial screening [12,14]. Studies have shown that re-screening can identify new cases of MRSA [12,14]. Re-screening before an additional surgery may be beneficial for these cohorts, as it may identify new MRSA carriage and prompt a change in perioperative antibiotic selection.

REFERENCES

[1] Weiser MC, Moucha CS. The current state of screening and decolonization for the prevention of staphylococcus aureus surgical site infection after total hip and knee arthroplasty. J Bone Joint Surg Am. 2015;97:1449–1458. doi:10.2106/JBJS.N.01114.

[2] Kalmeijer MD, van Nieuwland–Bollen E, Bogaers–Hofman D, de Baere GA. Nasal carriage of staphylococcus aureus is a major risk factor for surgical–site infections in orthopedic surgery. Infect Control Hosp Epidemiol. 2000;21:319–323. doi:10.1086/501763.

[3] Gorwitz RJ, Kruszon–Moran D, McAllister SK, McQuillan G, McDougal LK, Fosheim GE, et al. Changes in the prevalence of nasal colonization with staphylococcus aureus in the United States, 2001–2004. J Infect Dis. 2008;197:1226–1234. doi:10.1086/533494.

[4] Kohler P, Bregenzer–Witteck A, Rettenmund G, Otterbech S, Schlegel M. MRSA decolonization: success rate, risk factors for failure and optimal duration of follow–up. Infection. 2013;41:33–40. doi:10.1007/s15010–012–0290–1.

[5] Sai N, Laurent C, Strale H, Denis O, Byl B. Efficacy of the decolonization of methicillin–resistant Staphylococcus aureus carriers in clinical practice. Antimicrob Resist Infect Control. 2015;4:56. doi:10.1186/s13756–015–0096–x.

[6] Sousa RJG, Barreira PMB, Leite PTS, Santos ACM, Ramos MHSS, Oliveira AF. Preoperative staphylococcus aureus screening/decolonization protocol before total joint arthroplasty–results of a small prospective randomized trial. J Arthroplasty. 2016;31:234–239. doi:10.1016/j.arth.2015.08.003.

[7] Schweizer ML, Chiang HY, Septimus E, Moody J, Braun B, Hafner J, et al. Association of a bundled intervention with surgical site infections among patients undergoing cardiac, hip, or knee surgery. JAMA. 2015;313:2162–2171. doi:10.1001/jama.2015.5387.

[8] Kim DH, Spencer M, Davidson SM, Li L, Shaw JD, Gulczynski D, et al. Institutional prescreening for detection and eradication of methicillin–resistant staphylococcus aureus in patients undergoing elective orthopaedic surgery. J Bone Joint Surg Am. 2010;92:1820–1826. doi:10.2106/JBJS.I.01050.

[9] Sadigursky D, Pires HS, Rios SA, Rodrigues Filho FL, Queiroz GC de, Azi ML. Prophylaxis with nasal decolonization in patients submitted to total knee and hip arthroplasty: systematic review and meta–analysis. Rev Bras Ortop. 2017;52:631–637. doi:10.1016/j.rboe.2016.10.018.

[10] Chen AF, Wessel CB, Rao N. Staphylococcus aureus screening and decolonization in orthopaedic surgery and reduction of surgical site infections. Clin Orthop Relat Res. 2013;471:2383–2399. doi:10.1007/s11999–013–2875–0.

[11] Baratz MD, Hallmark R, Odum SM, Springer BD. Twenty percent of patients may remain colonized with methicillin–resistant staphylococcus aureus despite a decolonization protocol in patients undergoing elective total joint arthroplasty. Clin Orthop Relat Res. 2015;473:2283–2290. doi:10.1007/s11999–015–4191–3.
[12] Moroski NM, Woolwine S, Schwarzkopf R. Is preoperative staphylococcal decolonization efficient in total joint arthroplasty. J Arthroplasty. 2015;30:444–446. doi:10.1016/j.arth.2014.10.017.
[13] Immerman I, Ramos NL, Katz GM, Hutzler LH, Phillips MS, Bosco JA. The persistence of staphylococcus aureus decolonization after mupirocin and topical chlorhexidine: implications for patients requiring multiple or delayed procedures. J Arthroplasty. 2012;27:870–876. doi:10.1016/j.arth.2012.01.010.
[14] Economedes DM, Deirmengian GK, Deirmengian CA. Staphylococcus aureus colonization among arthroplasty patients previously treated by a decolonization protocol: a pilot study. Clin Orthop Relat Res. 2013;471:3128–3132. doi:10.1007/s11999–013–2856–3.
[15] Slover J, Haas JP, Quirno M, Phillips MS, Bosco JA. Cost–effectiveness of a staphylococcus aureus screening and decolonization program for high–risk orthopedic patients. J Arthroplasty. 2011;26:360–365. doi:10.1016/j.arth.2010.03.009.
[16] Peterson LR, Samia NI, Skinner AM, Chopra A, Smith B. Antimicrobial stewardship lessons from mupirocin use and resistance in methicillin–resitant staphylococcus aureus. Open Forum Infect Dis. 2017;4:ofx093. doi:10.1093/ofid/ofx093.