

G28: Does the discharge disposition (home vs a facility) of a patient influence the risk of surgical site infection (SSI) and/or periprosthetic joint infection(PJI) in patients undergoing major orthopedic procedures?

Alparslan Uzun, Kadir Uzel, Yona Kosashvili, Mehmet Kürşat Yılmaz, Emmanuel Gibon, Omar Behery, İbrahim Azboy

Response/Recommendation: Although non-home discharge has been shown to increase the risk of overall complications and readmission, the existing evidence is conflicting when specifically evaluating the impact of non-home discharge on the risk of surgical site infections (SSI) and periprosthetic joint infections (PJI) following major orthopedic surgery. However, given the increased associated costs and other associated complications with non-home disposition, discharge to home may ultimately be the preferred option.

Level of Evidence: Moderate

Delegate Vote:

Rationale: With the increasing demand for total joint arthroplasty (TJA) worldwide, and increasing importance of cost-effective patient care, optimizing postoperative care and discharge planning has become a critical aspect of patient management towards maximizing clinical outcomes in a cost-conscious manner. Patient discharge disposition following major orthopaedic surgery which is likely multifactorial, and includes home or subacute or acute nursing / rehabilitation post acute care (PAC) facilities may play a key role in influencing both clinical outcomes and healthcare costs [1]. While inpatient rehabilitation facilities (IRF) and skilled nursing facilities (SNF) aim to provide structured alternative post-operative recovery setting to address the post-operative needs of patients following major orthopedic surgery, albeit at higher costs, home discharge has gained increasing preference, due to potential benefits, including lower complication rates, improved functional recovery, and reduced healthcare expenditures [2-5]. However, the impact of different discharge disposition on postoperative complications, particularly surgical site infections (SSI) and periprosthetic joint infections (PJI) following major orthopedic surgery, remains controversial.

Discharge disposition is likely predicated, at least partially, on multiple patient-related factors. In a multivariate analysis of predictors for discharge to an inpatient facility, Fu et al. identified age >75 years as the strongest predictor (OR: 2.76; 95% CI, 2.61–2.91), followed by pre-discharge complications (OR: 2.42; 95% CI, 2.02–2.91), non-independent functional status (OR: 2.09; 95% CI, 1.85–2.35), and a modified Charlson Comorbidity Index (CCI) >5 (OR: 2.02; 95% CI, 1.90–2.15) [2].

Despite the relatively high utilization of PAC services and associated costs, evidence remains limited regarding the associated clinical impact on post-discharge outcomes [3]. Recent literature suggests that patients undergoing major orthopedic surgery, whom are discharged to non-home facilities experience both inferior functional outcomes and an increased risk of 30-day complications and readmission [3–7]. Despite concerns for selection bias in this scenario given that lower functioning, higher-risk patients with limited social support would be more likely to be discharged to non-home facilities, evidence utilizing propensity matching, multivariate regression analyses in other studies have demonstrated a significant increase in odds ratios for complications among those with non-home discharge post-operatively. [2,8]

A more detailed examination of complication rates specifically SSI and deep infection, reveals varying results across different studies. In the arthroplasty literature, Fu et al. analyzed a cohort of 54,837 patients, of whom 26% were discharged to inpatient facilities (SNF and IRF). Their propensity-matched regression analysis demonstrated that discharge to an inpatient facility rather than home was significantly associated with an increased risk of wound complications, including SSI, organ/space infection and wound dehiscence (OR: 1.31; 95% CI, 1.09–1.57; $p=0.004$) [2].

Similarly, a 2018 study by Stone et al. found that among 7,466 TJA patients, those discharged to SNFs had a significantly higher risk of SSI/PJI within the first 90 days (19.6% vs. 10.3%, $p=0.02$) [9]. Another study by Malik et al. reported that patients undergoing hip hemiarthroplasty (HA), total hip arthroplasty (THA), or open reduction and internal fixation for hip fractures had an increased risk of wound complications (both superficial and deep SSI) when discharged to an inpatient facility (OR: 1.79; 95% CI, 1.10–2.91; $p=0.01$) [3].

Treu et al. further demonstrated that among patients undergoing HA or THA for femoral neck fractures, those discharged to SNFs had significantly higher 90-day and 1-year PJI risks compared to those discharged home (OR: 4.55, $p=0.001$, and OR: 3.08, $p=0.03$, respectively). Additionally, the time to PJI development was significantly shorter in SNF patients (38 vs. 231 days, $p=0.01$). When comparing SNF to IRF, SNF patients had significantly higher 90-day and 1-year PJI risks (OR: 3.45, $p=0.04$, and OR: 3.76, $p=0.03$, respectively). However, no significant difference was observed between the IRF and home discharge groups [7]. Another study analyzing 35,973 patients undergoing posterior lumbar fusion surgery compared those discharged home with those discharged to IRF/SNF. The results showed significantly lower rates of SSI (0.91% vs. 1.68%, $p<0.0001$), deep wound infection (0.61% vs. 1.14%, $p<0.0001$), organ/space infection (0.19% vs. 0.53%, $p<0.0001$), and wound dehiscence (0.19% vs. 0.53%, $p<0.0001$) in patients discharged home. Additionally, SSI rates were significantly higher in patients discharged to SNF compared to those discharged to IRF (2.2% vs. 1.04%, $p<0.0002$), while no significant differences were found between these groups in terms of deep wound infection, organ/space infection, or wound dehiscence [10]. Similarly, Park et al. [6] analyzed 13,050 lumbar surgery patients and found that home discharge was protective against SSI compared to IRF/SNF within 30 days postoperatively (OR: 0.47).

Contrary to these findings, there are also studies reporting no significant difference in terms of SSI/PJI between different patient discharge dispositions. Mayer et al. [4] analyzed 78,821 THA patients (home discharge: 75.4%) and 137,675 TKA patients (home discharge: 71.0%) and found no significant difference in SSI rates between the home and non-home discharge (SNF, IRF) groups after propensity matching. However, all other complications, including cardiac, respiratory, readmission, and reoperation rates, were significantly higher in the non-home discharge disposition group. Similarly, McLawhorn et al. [8] examined 101,256 patients undergoing primary total knee arthroplasty (TKA) (home discharge: 69.7%) and found no significant difference in wound complications (superficial and deep SSI, organ/space infection) between the two groups in a propensity-adjusted multivariable regression analysis. Owens et al. [11] also investigated 34,610 patients undergoing primary THA or TKA (home discharge: 54.8%) and found no significant difference in SSI rates between the home and non-home groups. However, they reported that discharge to an SNF was an independent risk factor for 30-day complications and readmission (OR: 1.9; 95% CI, 1.7–2.0).

Keswani et al. [12] analyzed 106,360 patients undergoing primary THA and TKA, where 70% were discharged home, 19% to an SNF, and 11% to an IRF. No significant difference was observed in superficial or deep SSI rates between home-discharge and SNF/IRF groups. However, their study found that organ/space infections and wound dehiscence were significantly higher in the non-home discharge group, with no difference between SNF and IRF. Patients discharged to SNF and IRF had a higher risk of total adverse events (OR: 1.46

and 1.59, respectively). Padgett et al. [13] examined 8,145 patients undergoing primary TKA and performed propensity score matching, yielding 1,213 matched patients in the home vs. IRF group and 492 matched patients in the SNF vs. IRF group. The SSI rates were insignificant for both groups [home vs. IRF group: 2.1% vs. 1.8%, $p=0.64$ and SNF vs IRF group: 3.4% vs. 2.3%, $p=0.37$]. A study investigating the impact of discharge disposition following shoulder arthroplasty analyzed 9,058 patients, with 88.2% discharged home and 11.8% to a non-home facility (IRF, SNF). No significant difference was found in SSI rates between the two groups (0.06% vs. 0.00%) [14].

Beyond these comparisons, Fleischman et al. [15] investigated differences among patients discharged home based on whether they lived alone or with a caregiver. While significant differences were observed in-hospital length of stay and the need for in-home physiotherapy, no significant differences were found in wound infection or PJI risk between the groups. Reoperation due to infection was required in 0.7% of patients living alone, compared to 0.79% in the control group ($p=1.0$).

Another important consideration is that discharge disposition is a major determinant of the total cost in episode of care following TJA. Home discharge with outpatient rehabilitation is approximately \$6,000 less expensive than discharge to a SNF and \$16,000 less expensive than discharge to an IRF [16]. In lower extremity arthroplasty, PAC constitutes more than one-third of total costs, primarily due to the utilization of IRFs and SNFs [17].

Additionally, although regression models have attempted to account for various variables, the potential for confounding due to unmeasured factors cannot be entirely eliminated in observational studies [18]. For instance, a patient's socioeconomic status has been associated with both non-home discharge and adverse events following TKA [19,20]. However, many studies have been unable to adequately define and compare this variable, making it a potential confounding factor.

Conclusion: Literature review demonstrated that non-home discharge has been shown to increase the risk of overall complications and readmission following major orthopedic surgery, however its impact on SSI and PJI remains unclear based on conflicting evidence. Given the rising costs and other associated complications, discharge to home may still be the preferred option after major orthopaedic procedures when considering the broader perspective.

References :

- (1) Tessier JE, Rupp G, Gera JT, et al. Physicians with defined clear care pathways have better discharge disposition and lower cost. *J Arthroplasty* 2016;31:54.
- (2) Fu MC, Samuel AM, Sculco PK, MacLean CH, Padgett DE, McLawhorn AS. Discharge to Inpatient Facilities After Total Hip Arthroplasty Is Associated With Increased Postdischarge Morbidity. *J Arthroplasty*. 2017 Sep;32(9S):S144-S149.e1.
- (3) Malik AT, Jain N, Frantz TL, Quatman CE, Phieffer LS, Ly TV, Khan SN. Discharge to inpatient care facilities following hip fracture surgery: incidence, risk factors, and 30-day post-discharge outcomes. *Hip Int*. 2022 Jan;32(1):131-139.
- (4) Mayer MA, Pirruccio K, Sloan M, Sheth NP. Discharge Home is Associated With Decreased Early Complications Following Primary Total Joint Arthroplasty. *J Arthroplasty*. 2019 Nov;34(11):2586-2593.

- (5) Clouette J, Agarwalla A, Ravi B, Gandhi R, Maldonado-Rodriguez N, Saltzman BM, Romeo AA, Leroux TS. Same-Day Discharge Following Total Joint Arthroplasty: Examining Trends, Discharge Dispositions, and Complications Over Time. *Orthopedics*. 2020 Jul 1;43(4):204-208. doi:
- (6) Park C, Cook CE, Garcia AN, Gottfried ON. Discharge destination influences risks of readmission and complications after lumbar spine surgery in severely disabled patients. *Clin Neurol Neurosurg*. 2021 Aug;207:106801.
- (7) Treu EA, Frandsen JJ, DeKeyser GJ, Blackburn BE, Archibeck MJ, Anderson LA; Arthroplasty for Hip Fracture Consortium; Gililland JM. Discharge to a Skilled Nursing Facility After Hip Fracture Results in Higher Rates of Periprosthetic Joint Infection. *J Arthroplasty*. 2024 Sep;39(9S1):S55-S60.
- (8) McLawhorn AS, Fu MC, Schairer WW, Sculco PK, MacLean CH, Padgett DE. Continued Inpatient Care After Primary Total Knee Arthroplasty Increases 30-Day Post-Discharge Complications: A Propensity Score-Adjusted Analysis. *J Arthroplasty*. 2017 Sep;32(9S):S113-S118.
- (9) Stone AH, Dunn L, MacDonald JH, King PJ. Reducing Length of Stay Does Not Increase Emergency Room Visits or Readmissions in Patients Undergoing Primary Hip and Knee Arthroplasties. *J Arthroplasty*. 2018 Aug;33(8):2381-2386.
- (10) Arrighi-Allisan AE, Neifert SN, Gal JS, Deutsch BC, Caridi JM. Discharge Destination as a Predictor of Postoperative Outcomes and Readmission Following Posterior Lumbar Fusion. *World Neurosurg*. 2019 Feb;122:e139-e146. doi: 10.1016/j.wneu.2018.09.147.
- (11) Owens JM, Callaghan JJ, Duchman KR, Bedard NA, Otero JE. Short-term Morbidity and Readmissions Increase With Skilled Nursing Facility Discharge After Total Joint Arthroplasty in a Medicare-Eligible and Skilled Nursing Facility-Eligible Patient Cohort. *J Arthroplasty*. 2018 May;33(5):1343-1347.
- (12) Keswani A, Tasi MC, Fields A, Lovy AJ, Moucha CS, Bozic KJ. Discharge Destination After Total Joint Arthroplasty: An Analysis of Postdischarge Outcomes, Placement Risk Factors, and Recent Trends. *J Arthroplasty*. 2016 Jun;31(6):1155-1162.
- (13) Padgett DE, Christ AB, Joseph A, Lee Y-Y, Haas SB, Lyman S. Discharge to Inpatient Rehab Does Not Result in Improved Functional Outcomes Following Primary Total Knee Arthroplasty., *The Journal of Arthroplasty* (2018), doi: 10.1016/j.arth.2017.12.033
- (14) Apostolakos JM, Boddapati V, Fu MC, Erickson BJ, Dines DM, Gulotta LV, Dines JS. Continued Inpatient Care After Primary Total Shoulder Arthroplasty Is Associated With Increased Short-term Postdischarge Morbidity: A Propensity Score-Adjusted Analysis. *Orthopedics*. 2019 Mar 1;42(2):e225-e231. doi: 10.3928/01477447-20190125-02.
- (15) Fleischman AN, Austin MS, Purtill JJ, Parvizi J, Hozack WJ. Patients Living Alone Can Be Safely Discharged Directly Home After Total Joint Arthroplasty: A Prospective Cohort Study. *J Bone Joint Surg Am*. 2018 Jan 17;100(2):99-106. doi: 10.2106/JBJS.17.00067. PMID: 29342059.

- (16) Ramos NL, Wang EL, Karia RJ, Hutzler LH, Lajam CM, Bosco JA. Correlation between physician specific discharge costs, LOS, and 30-day readmission rates: an analysis of 1,831 cases. *J Arthroplasty* 2014;29:1717e22.
- (17) Bozic KJ, Ward L, Vail TP, et al. Bundled payments in total joint arthroplasty: targeting opportunities for quality improvement and cost reduction. *Clin Orthop Relat Res* 2014;472:188.
- (18) Inacio MCS, Chen Y, Paxton EW, et al. Statistics in brief: an introduction to the use of propensity scores. *Clin Orthop Relat Res* 2015;473(8):2722.
- (19) Freburger JK, Holmes GM, Ku L-JE, et al. Disparities in post-acute rehabilitation care for joint replacement. *Arthritis Care Res (Hoboken)* 2011;63:1020.
- (20) Inneh IA, Clair AJ, Slover JD, et al. Disparities in discharge destination after lower extremity joint arthroplasty: analysis of 7924 patients in an urban setting. *J Arthroplasty* 2016;31(12):2700