Optimizing efficiency and redefining benchmarks in a high-volume primary joint hip and knee arthroplasty program

Koorosh Kashanian[1], Tim Ramsay[2], Paul E. Beaulé[1,3]
[1]University of Ottawa Faculty of Medicine, Ottawa, ON; [2]Ottawa Methods Centre, Ottawa, ON, [3]Division of Orthopaedic Surgery, The Ottawa Hospital, Ottawa, ON

Disclosures: Koorosh Kashanian (N), Tim Ramsay (N) Paul Beaulé (Corin, MicroPort, Medacta, MatOrtho, Zimmer Biomet, Stryker, Wolters and Kluwer, ISHA)

INTRODUCTION: With rising overhead costs and an increase in demand for primary total hip arthroplasty (THA) and total knee arthroplasty (TKA), it is of vital importance that arthroplasty programs streamline to maximize operating room (OR) efficiency. Most surgical centers use a target of four joints operated within an eight-hour shift in one OR, with the benchmarks to meet this quota being well-defined. Following positive deviance seminars and applying SLIM instrumentation, our arthroplasty group introduced five joint rooms to address the backlog from COVID. The purpose of this paper was to examine what benchmarks are needed to achieve a sustainable model of five joints performed in one operating room.

METHODS: After institutional review board approval, from February 25th to August 5th, 2023, seven fellowship-trained surgeons, and eleven anesthesiologists participated in 39 five joint days (195 cases): 89 THA and 106 TKA. Patients included 111 females and 84 males; mean age, 65.5; mean body mass index (BMI), 29 kg/m^2; ASA, 2. Time data was recorded using Surgical Information Management Systems, while hospital records demonstrated demographics, adverse events, and anesthetic details. Key time points were defined, including the anesthesia preparation time (APT), time from the patient entering the room to anesthesia being ready; surgical preparation time (SPT), time from anesthesia ready to case start; time of the procedure, case start to case finish; anesthesia finish time (AFT), case finish to patient exiting the OR; and turnover, patient exit to next patient in OR (Figure 1). Data was analyzed using Excel.

RESULTS SECTION: One surgeon, who completed forty cases in eight days, had a median procedure time of 43 minutes (Min 30, Max 93), which was 13 minutes faster than all the other surgeons, hence we removed him from further analysis so not to skew the data. After removal of that surgeon's cases, the median and min/max for each time point were as follows: APT median of 11 minutes (Min 1, Max 45), SPT 9 minutes (Min 1, Max 29), procedure time 56 minutes (Min 37, Max 96), AFT 3 minutes (Min 1, Max 28), turnover 19 minutes (Min 2, Max 34). We had a median start time—first patient in the room of 7:24 AM and finish time—last patient out of the room— of 3:15 PM for five joints, or 1:37 PM if the OR was stopped after the fourth joint.

DISCUSSION: In our program, we found that the median total time for a five-joint day was 471 minutes, which falls under the 480 minutes of a standard 8-hour OR (Figure 2). The reported medians for each time point should be defined as benchmarks to ensure the successful completion of five joint OR days, even finishing with time to spare. Without any intervention, out of 31 five joint days, we had a 48% (15/31) success rate in having the last patient leave the operating room by 3:30 PM, which is the standard end-time for operative days in our region. These are highly motivating results since they demonstrate the feasibility of incorporating five joint days as the new standard at our institution, even before we had our newly defined benchmarks to ensure swift progression during the operative day. With the new benchmarks, the institution of standardized five joint days would decrease the load on our strained healthcare system, as well as provide a welcome reduction in costs-per patient, since an extra joint could be completed per OR for the same overhead cost.

SIGNIFICANCE/CLINICAL RELEVANCE: Redefining operative benchmarks to allow for the successful completion of five joints per standard OR day is a critical step in moving from the traditional four joint OR day to five joints. By making this transition to five joints, key stakeholders including the patient, surgeons, and healthcare administrators all experience benefits with lower overhead costs per case, increased patient throughput and greater team coherency and opportunities for improvement.

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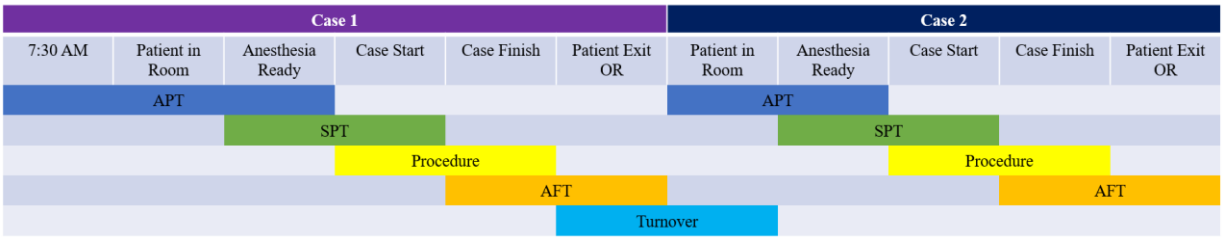

Figure 1: Time intervals during a five joint OR day

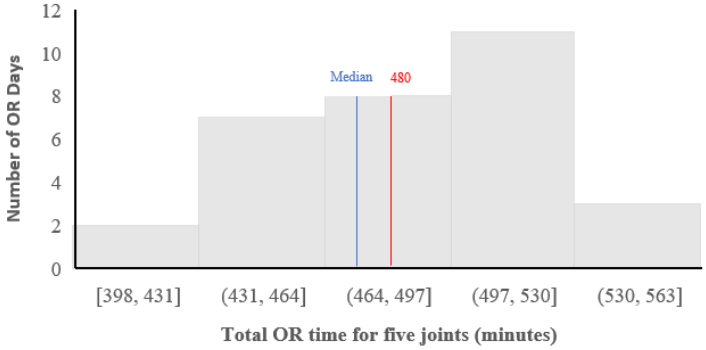

Figure 2: Distribution of median total OR time for five joints