

# Differing Surgical Times and Efficiency between Inpatient and Ambulatory Surgery Centers that are Both Hospital Owned

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# Introduction

- National debate exists regarding the utilization of ambulatory facilities for surgical procedures.
- Primary Aim: to examine differences in Anterior Cruciate Ligament Reconstruction (ACLR) surgical time between inpatient and ambulatory facilities within the same institution
- Secondary Aim: to examine all the surgeries that were done on the same day of the ACL surgeries with the purpose of assessing Operating Room (OR) work efficiency reflected by percentage of work achieved before mid-day on all elective surgical days

**Inpatient facility: The Children's Hospital of Philadelphia (CHOP)**

**Ambulatory facility: CHOP owned Ambulatory Surgical Facility (ASC)**

# Methods

- Study design: Retrospective comparative cohort study
- Inclusion criteria:
  1. Patients younger than 21 years of age
  2. Primary ACLR surgery with or without meniscus surgery
  3. Surgeries that were performed by a single surgeon / the senior author (TG)
  4. Surgeries that occurred on an elective surgery day (No fractures or add-on cases)
- Exclusion criteria:
  1. Patients who had ACLRs with associated knee pathologies (collateral ligament injury or osteochondral lesions)
  2. Patients who had bone-tendon-bone graft
  3. Revision ACLR surgery
  4. ACLR surgeries that were performed by another orthopedic surgeon
  5. Surgeries that were performed on non-elective surgical days

# Time Variables

<b>In room time (minutes)</b>	Duration between (room-entry-time) and (out of room time)
<b>Surgery time (minutes)</b>	Duration between (start of surgery) and (end of surgery)
<b>Ancillary services (nursing, anesthesia induction and emergence) (minutes)</b>	(in room time) – (surgery time)
<b>Room entry delay (minutes)</b>	Difference between (room-entry-time) and the booked time.
<b>Turnover time (minutes)</b>	Duration between (out of room time of patient 1) and (room-entry-time of patient 2)
<b>Total surgery time for a day (minutes)</b>	Sum of (surgery time) of all cases of a day
<b>Total OR work time (minutes)</b>	Duration between (room-entry-time of the first patient) and (out of room time of the last patient).
<b>Surgery time before noon (minutes)</b>	Surgery time performed before 12 pm.
<b>OR work time before noon</b>	Time between (room-entry-time of patient 1) and 12.00 pm.
<b>Surgeon's time efficiency</b>	$\frac{\textit{Surgery time before noon}}{\textit{Total surgery time for a day}}$
<b>OR work time efficiency</b>	$\frac{\textit{OR work time before noon}}{\textit{Total OR work time}}$

Total number of surgeries: 359 ACLR surgeries between January 2009 and March 2013 on 287 surgical days.

Excluded:  
132 ACLR surgeries on 100 days

Study population: n= 227 ACLR surgeries that were done on 187 surgical days.

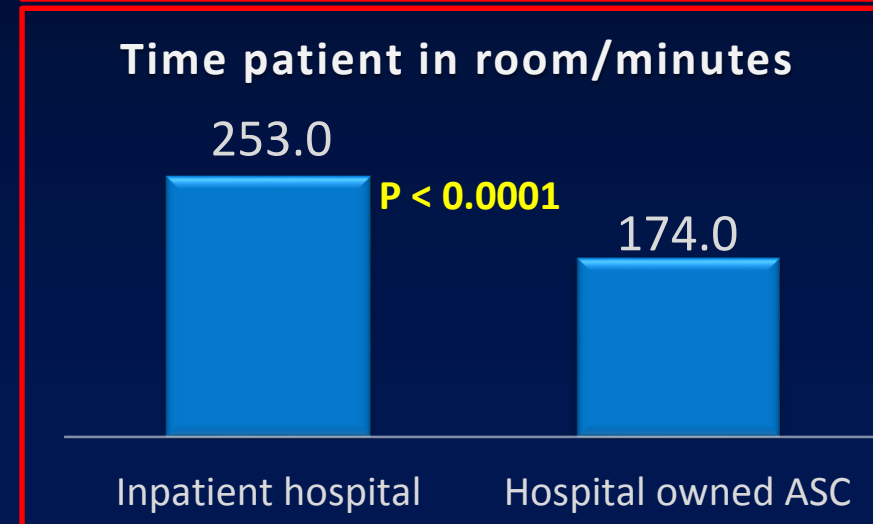
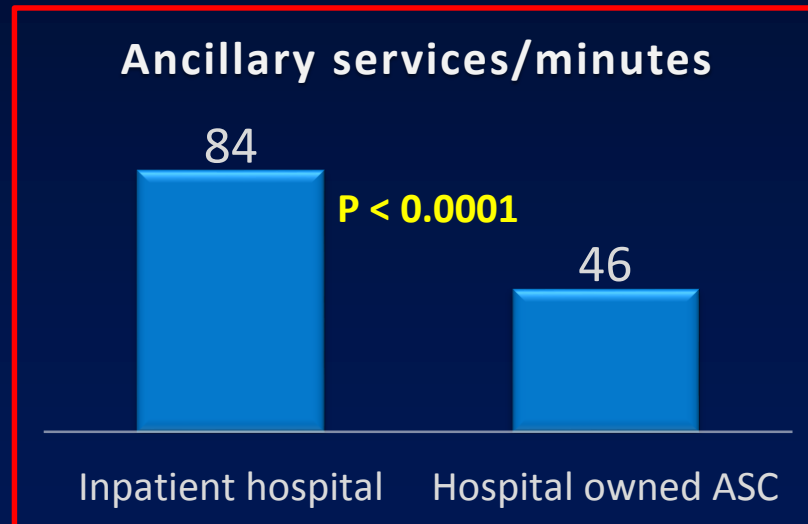
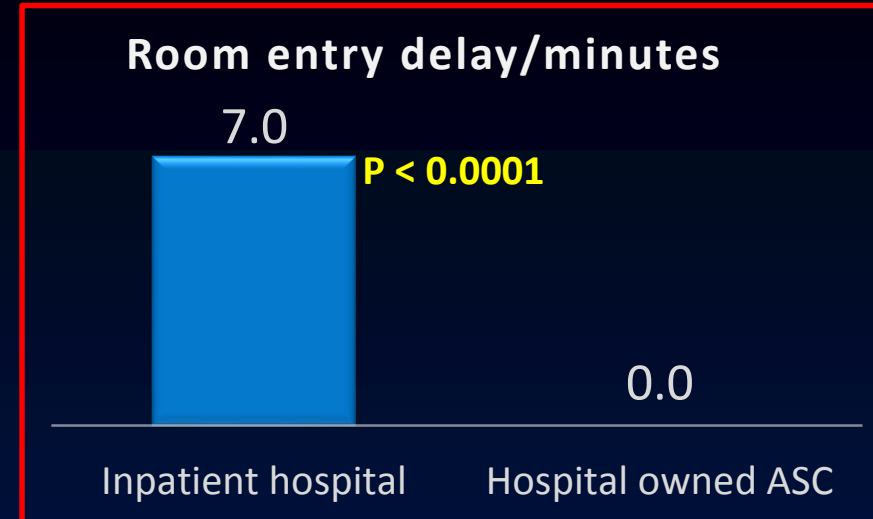
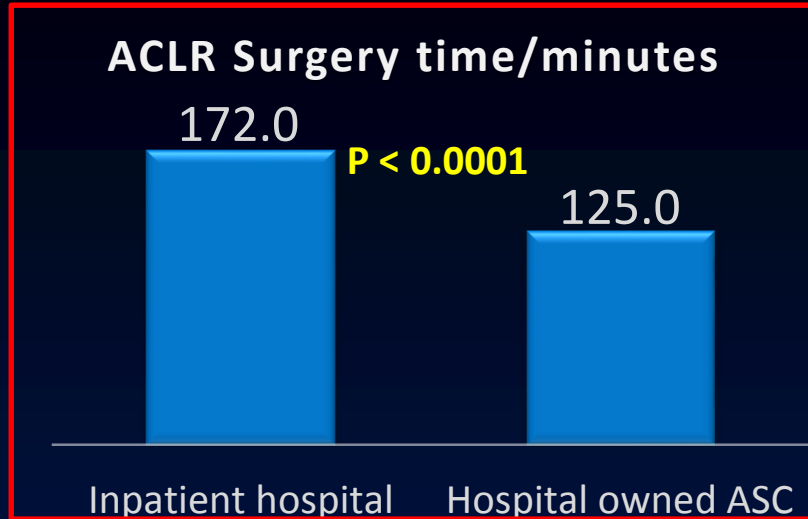
**Sex:** 118 boys (52%)  
109 girls (48%)

**Side:** 126 right (55%)  
101 left (45%)

**Location:** 153 at the inpatient hospital; 127 days  
74 at the hospital owned ASC; 60 days

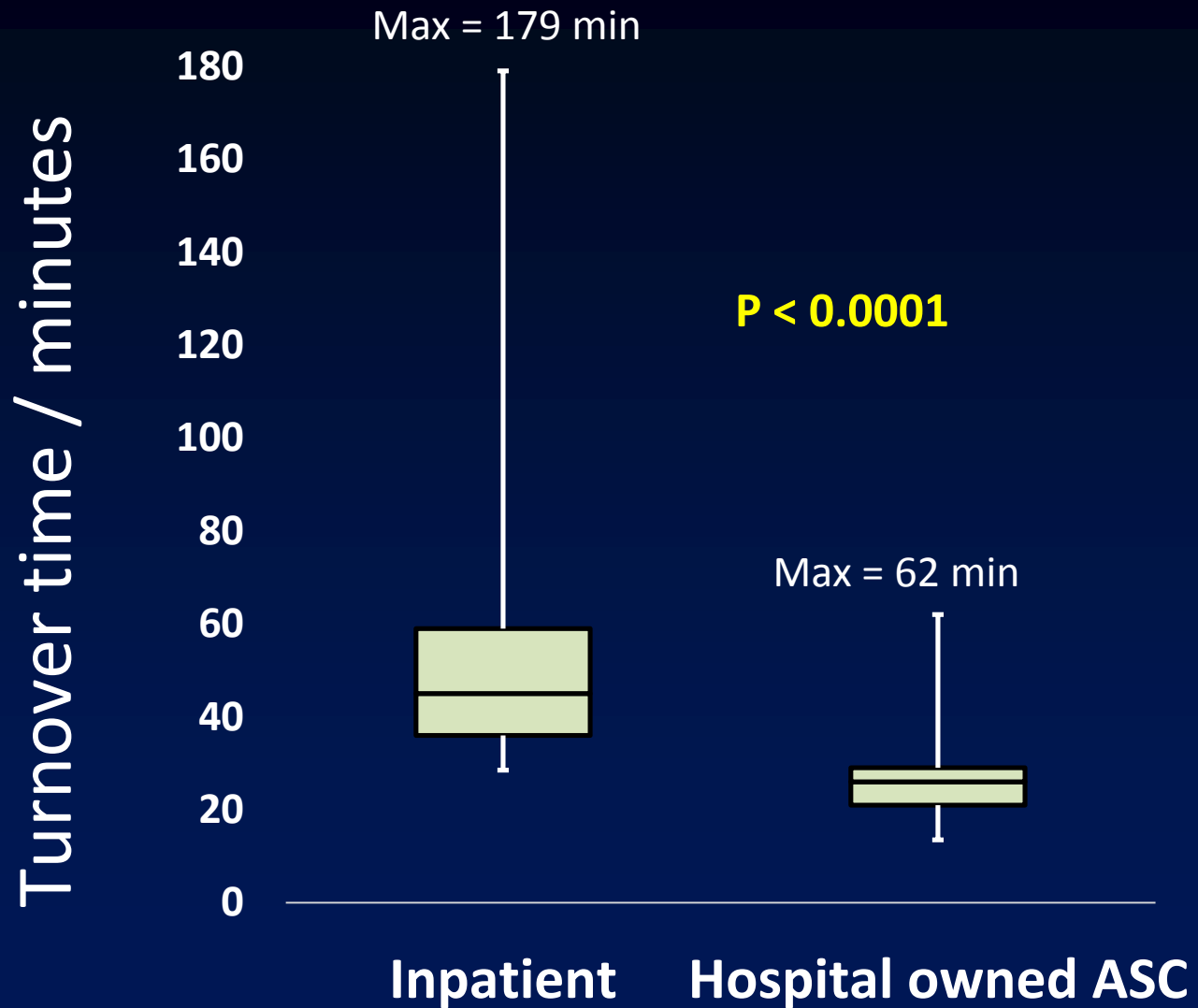
**Mean age at surgery was 14.9±2.2 years ranging from 8 to 21 years.**

# Time Analysis for ACLR surgeries



ACLR surgery time, duration of ancillary services, delay of room entry to the operation room encountered, and total time a patient was in the OR was shorter at the ambulatory facility compared to the inpatient hospital.

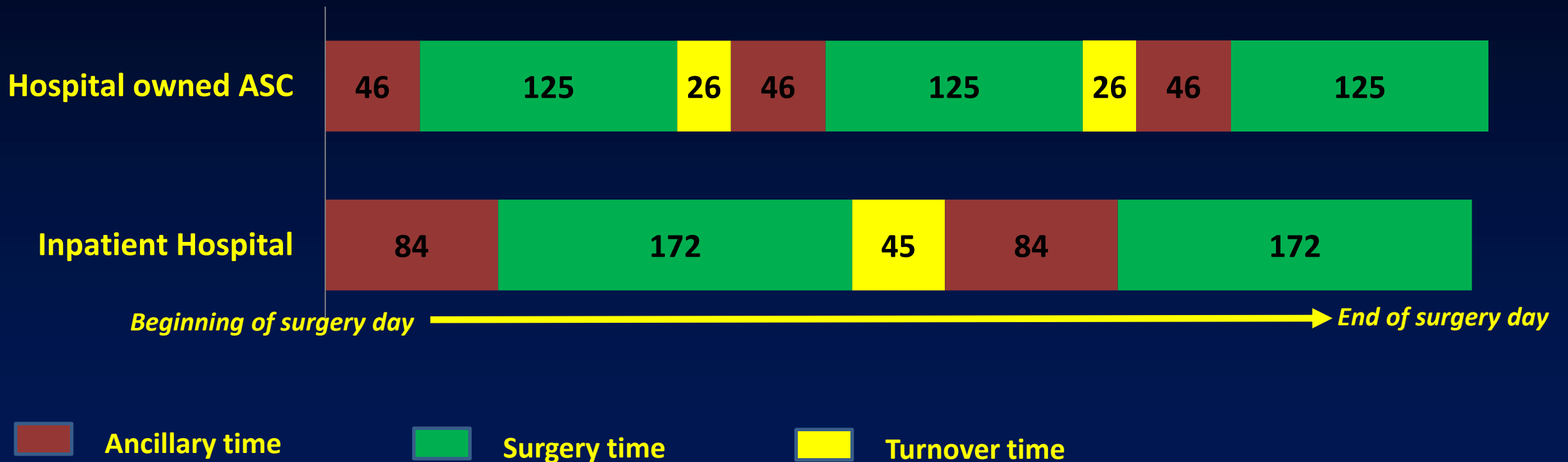
# Time Analysis for Elective Surgery Day



Turnover time\* was longer at the inpatient hospital (45 [36-59] min) compared to the ambulatory facility (26 [21-29] min).

\* Non parametric variables are presented by median and (25<sup>th</sup> and 75<sup>th</sup>) percentiles, and difference was computed using Mann Whitney U test

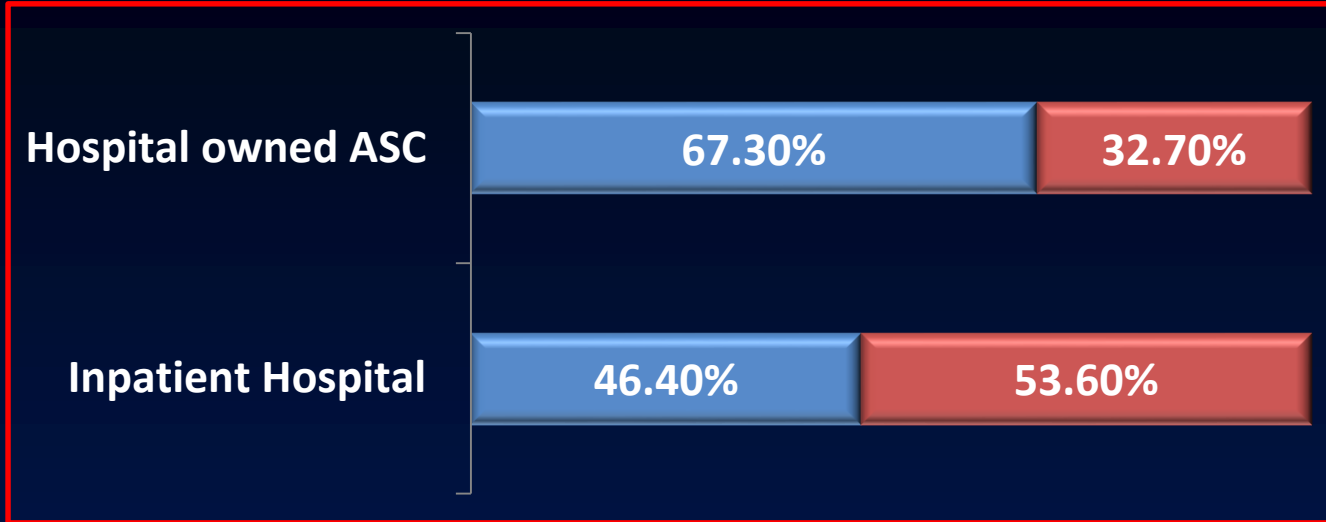
Time wheel demonstrates that 3 ACLR surgeries could be performed at the hospital owned ambulatory surgical center (ASC) compared to 2 surgeries at the inpatient hospital.



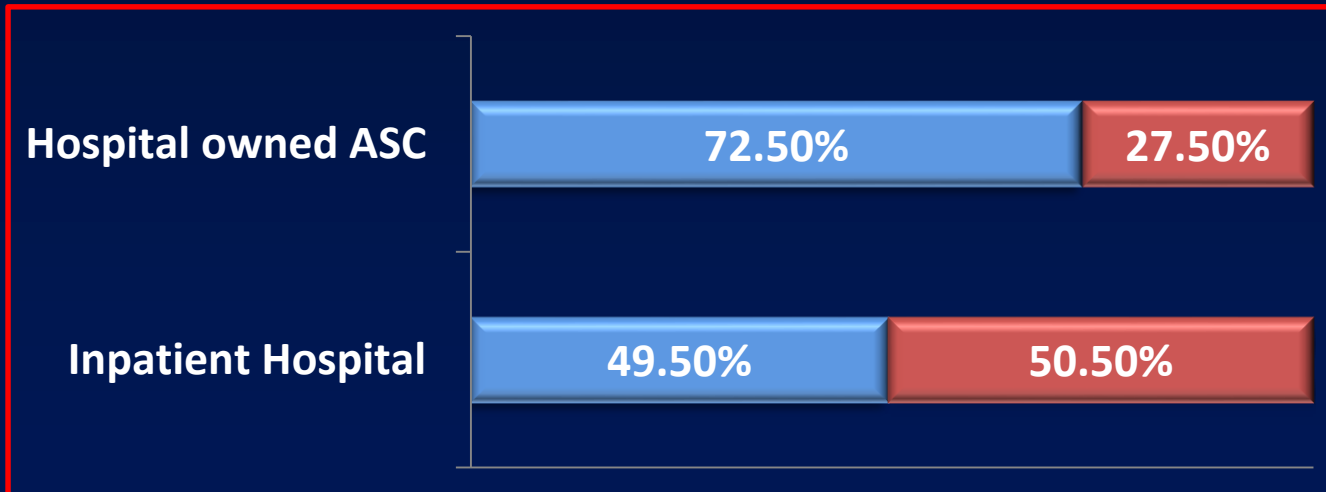


# OR Time Efficiency Analysis

(percentage of surgery done by mid-day)



**Surgery time** efficiency was 67.3% at the hospital owned ASC and 46.4 % at the inpatient hospital  $p < 0.0001$ .



**OR work time** efficiency was 72.5% at the hospital owned ASC and 49.5% at the inpatient hospital  $p < 0.0001$ .

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# Conclusion

- ACL Surgical efficiency was high at the hospital owned ASC compared to the inpatient hospital despite the fact that one OR was most commonly utilized in both hospitals and the number of elective surgeries per day was 2 to 3 surgeries on most surgery days at both centers.
- There was no significant difference in surgical outcomes between the two sites.
- Seven nurses served as alternating circulators at the hospital owned ASC compared to 41 nurses serving in the same capacity at the inpatient hospital.
- Four scrub technicians were involved at the ASC while 29 were involved at the inpatient hospital.
- It has been theorized that physicians perform more surgical procedures at ambulatory facilities due to private ownership<sup>(1-3)</sup>. However, this study reveals that the difference may be more related to the OR systems and the use of consistent OR teams when the surgeon is performing high volumes of the same surgical procedure.
- The authors believe that the common variables are as follow: the same surgeon performing the same surgical procedure at the same institution. In that setting, it is believed that with consistent surgical teams and ancillary service protocols, time can be made more similar.

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2. Malek MM, DeLuca JV, Kunkle KL, Knable KR. Outpatient ACL surgery: a review of safety, practicality, and economy. *Instr Course Lect.* 1996;45:281-6.
3. Merrill DG, Laur JJ. Management by outcomes: efficiency and operational success in the ambulatory surgery center. *Anesthesiol Clin.* 2010 Jun;28(2):329-51.