The Effect of Reducing Surgical Trays on OR Time, Sterile Processing Turnover and Episode of Care Costs

James Grimm, Rick Ditto, Robert Neher and Tim Sweeten

January, 2020

Introduction

One focal point in the future of orthopedics will be improving process efficiency and reducing operational costs for facilities. Traditionally, total joint replacement surgeries involve numerous trays of instruments that must be set up in the operating room (OR), removed from the OR, and cleaned and sterilized in the central processing department between surgeries. These activities require hospitals to invest significantly in cleaning and sterilization equipment and personnel. They also add significant time and cost to each procedure to prepare all instruments prior to each surgery.

Zimmer Biomet is committed to partnering with facilities looking for ways to streamline this instrument management burden. The Efficient Care program was developed to pare down instrument sets going into the OR to only what will be used in each surgery. Reducing instruments to only those required to support each surgical case takes waste out of the overall system, particularly in OR turnover rates and central processing department workload.

Materials and Methods

Observations / Measurements

In order to accurately assess the impact of the Efficient Care program, trained personnel observed all aspects of hip and knee replacements performed over the course of a standard work day at each participating facility. The team gathered data and captured time stamps related to the following key events and metrics:

OR	DEFINITION
Back table prep	From ST scrubbing in to complete (minutes)
Table ready to Pt in	From back table opened to patient in room (minutes)
In to Incision	Patient in room until first incision (minutes)
Incision to decision	From first incision to size decided (minutes)
Decision to first stitch	From size decided to first suture started (minutes)
Cut to close	From first incision to bandage on (minutes)
Room turnover	Patient out of room to next patient in (minutes)
Surgeon turnover	From surgeon out of room until surgeon scrubbed in for next case (minutes)
SPD	
Hand wash duration	From first pan begins to be washed to last pan is washed (minutes)
Reassemble duration	From first pan begins to reassembled until last is completed (minutes)
Wrap duration	From first pan begins to be wrapped until end of last pan wrapped (minutes)
Ultrasonic capacity	Pan capacity and cycle time (minutes)
Washer capacity	Pan capacity and cycle time (minutes)
Sterilizer capacity	Pan capacity and cycle time (minutes)
Overall	
Efficient Care	Has case been templated and reduced pans used (count)
Number of trays	ZB Trays only (count)
Weight	Physical weight of each pan (pounds)
Lifts	Observed lifts (count)
1 or 2 room model	Observed cases performed in single or double room (count)

These times were then aggregated into elapsed times for comparison.

Scope and Method

In order to create a valid study, sample size guidelines for observations were created and communicated before observations were conducted. These sample sizes were:

- 4 to 6 Knee and/or Hip replacement without using the Efficient Care system
- 4 to 6 Knee and/or Hip replacement with implementing the Efficient Care system

It is important to mention that no protected patient health information was recorded, stored or otherwise used for this study.

Quantification Methodology

We standardized the quantification process to normalize our comparatives from region to region.

Quantifying the savings in the Operating Room was done by comparing the elapsed time used for Efficient Care cases to Standard cases. The resulting variance was then multiplied by the cost per OR minute. We used $37 per minute based a 2018 study in JAMA Surgery.[2] This dollar per case variance was then multiplied by the number of cases performed annually to calculate the potential Operating Room cost savings.

Quantifying the Sterile Processing Department (SPD) savings is similar, but is based on the cost to reprocess a single tray. We compared the number of trays processed for an Efficient Care case to a Standard case. The number of Efficient Care trays processed subtracted from the number of Standard trays processed gave us the tray variance. We multiplied this by $58 to calculate the total SPD savings.[1]

Both the OR and the SPD cost savings were then multiplied by the annual number of surgeries provided by the surgeon to derive the estimated annual savings.

Results

Instrument tray optimization using the Zimmer Biomet Efficient Care Program generated substantial time and cost savings for the facilities in this study (Table 1). On average, the number of instrument trays used per case decreased from 5.3 to 3.0 with Efficient Care, which led to an average time savings of 17.0 minutes per case. Factoring in SPD costs per tray and costs per minute of OR time from peer-reviewed sources creates an estimated average savings of $762.81 per case (SPD savings -- $133.81; OR time savings -- $629.00) with adoption of the Efficient Care Program.[1] Detailed results for each of the seven surgeons and facilities studied is located in Table 3.

Table 1. Summary results of Efficient Care versus Standard Instruments

Parameter	Efficient Care	Standard Instruments
Average # of instrument trays	3.0 trays	5.3 trays
SPD costs per tray*	$58.18 / tray	$58.18 / tray
Average OR time saved	17.0 minutes	-
Cost per minute of OR time**	$37 / minute	$37 / minute
Estimated Savings		
— Average Efficient Care SPD savings per case	$133.81	
— Average Efficient Care OR time savings per case	$629.00	
— Average Efficient Care total savings per case	$762.81	

* SPD savings calculated by multiplying number of instrument trays reduced by $58.18 SPD cost per tray.[1]
** OR savings calculated by multiplying time saved (minutes) by $37 per minute of OR time.[2]

A Student's t-test was performed to compare the time- and weight-based endpoints of the two groups (Table 2). The Efficient Care setup was associated with a statistically significant difference in back table setup times (EC: 11.34 ± 6.19 min, Std: 23.13 ± 8.04 min, $p < 0.001$), OR turnover time (EC: 21.02 ± 2.30 min, Std: 24.83 ± 3.23 min, $p = 0.004$), decontamination time (EC: 10.07 ± 2.36 min, Std: 21.58 ± 7.04 min, $p = 0.001$), wrap duration (EC: 15.7 ± 15.0 min, Std: 30.4 ± 17.9 min, $p=0.047$), and weight of total instruments (EC: 44.6 ± 16.9 lbs, Std: 103.4 ± 26.3 lbs, $p=0.004$). There was not a statistically significant difference in incision-to-close time (EC: 24.28 ± 6.70 min, Std: 26.09 ± 6.77, $p = 0.392$), entry-to-incision time (EC: 19.39 ± 3.74, Std: 19.84 ± 4.52, $p = 0.728$), or case picking (EC: 4.06 ± 1.67, Std: 5.54 ± 2.79, $p = 0.223$).

Table 2. Detailed time- and weight-based results between groups

Parameter	Efficient Care	Standard Instruments	p-value
Time-Based Endpoints			
— Back Table Setup Time (minutes)	11.34 ± 6.19	23.13 ± 8.04	< 0.001*
— OR Turnover Time (minutes)	21.02 ± 2.30	24.83 ± 3.23	0.004*
— Decontamination Time (minutes)	10.07 ± 2.36	21.58 ± 7.04	0.001*
— Wrap Duration Time (minutes)	15.70 ± 15.00	30.40 ± 17.90	0.047*
— Entry-to-Incision Time (minutes)	19.39 ± 3.74	19.84 ± 4.52	0.728
— Incision-to-Close Time (minutes)	24.28 ± 6.70	26.09 ± 6.77	0.392
— Case Picking Time (minutes)	4.06 ± 1.67	5.54 ± 2.79	0.223
Weight-Based Endpoints			
— Weight (pounds)	44.6 ± 16.9	103.4 ± 26.3	0.004*

* Statistically significant difference between groups ($p < 0.05$)

Table 3. Detailed results for all seven surgeons studied

Parameter	Surgeon 1	Surgeon 2	Surgeon 3	Surgeon 4	Surgeon 5	Surgeon 6	Surgeon 7
Annual Surgical Volume	150	150	200	200	450	150	165
Time-Based Endpoints							
— Per case SPD time savings (minutes)	59	10	28	28	29	70	88
— # of trays eliminated	3	2	1	1	2	3	4
— Per case OR time savings (minutes)	22	11	12	22	13	14	25
*— Per case SPD Savings**	$174.54	$116.36	$58.18	$58.18	$116.36	$174.54	$232.72
*— Per case OR Savings***	$814.00	$407.00	$444.00	$814.00	$481.00	$518.00	$925.00
Weight-Based Endpoints							
— Instrument Weight Reduced (pounds)	-	-	43	49	40	70	92

* SPD savings calculated by multiplying number of instrument trays reduced by $58.18 SPD cost per tray.[1]
** OR savings calculated by multiplying time saved (minutes) by $37 per minute of OR time.[2]

Summary

The healthcare system is under immense pressure to deliver improved care while reducing the overall cost. Additionally, surgical case volumes are projected to continue increasing, so facilities must implement practices that enable them to manage this volume while reducing the overall cost per case. Novel efficiency solutions must quickly prove their worth, and be flexible enough to adapt to surgeon and patient variability. They must also be sustainable so old, more expensive, habits do not reappear. This type of institutional change is only possible through true collaboration and partnership between all of the stakeholders in the joint replacement process.

References

1. Watters, *et al.*; Analysis of procedure-related costs and proposed benefits of using patient-specific approach in total knee arthroplasty; Journal of Surgical Orthopaedic Advances; 2011; V20: 112-116.
2. Childers, C., Maggard-Gibbons, M., Understanding Costs of Care in the Operating Room. JAMA Surg. 2018; 153(4): e176233. doi:10.1001/jamasurg.2017.6233

ZIMMER BIOMET

Your progress. Our promise.®

2959.1-US-en-REV0120

www.zimmerbiomet.com