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The Effect of a 6am-9am Dedicated Orthopaedic Trauma Room on Hip Fracture Outcomes in a Community Level II Trauma Center

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Abstract

Objective: To assess the outcomes of elderly hip fracture surgeries performed 12 months before and 12 months after the implementation of a daily 6am-9am DOTR at a Level II community trauma center.

Design: Retrospective cohort study

Setting: Level II academic trauma center

Patients: A total of 431 consecutive trauma patients undergoing surgical management of isolated low energy hip fractures from January 1, 2018, to December 31, 2019.

Intervention: Implementation of a 6am-9am DOTR Monday through Friday

Main Outcome Measures: Time to surgery, number of cases performed after-hours, surgical time, 90-day morbidity and mortality, and time to therapy.

Results: Retrospective analysis showed that despite a 24% increase in surgical hip fracture volume, implementation of a part-time DOTR led to a decrease in after-hours surgery (32.4% vs. 19.6%; *P*=0.008) and patients requiring the intensive care unit postoperatively (7% vs. 3.8%; *P*=0.036). Surgeries performed after-hours were longer compared to surgeries performed during the daytime (82.0 minutes vs. 68 minutes; *P*=0.003) and had more complications (pneumonia, pulmonary embolism and surgical site infection; *P*=0.002, 0.047, 0.024, respectively).

Conclusions: Our results show that a part-time DOTR in a community Level II hospital is associated with improvement in patient care.

Key Words: Dedicated Orthopaedic Trauma Room; hip fracture; after-hours surgery; part time

Level of Evidence: Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.

INTRODUCTION

Multiple studies over the past two decades have reviewed the dedicated orthopaedic trauma room (DOTR) model at tertiary care centers, which has proven itself a helpful solution to the unique urgent but not emergent challenge that orthopaedic trauma presents.[1-10] A daily DOTR, as described by Min et al,[5] has been shown to reduce patient morbidity and mortality, improve operating room (OR) efficiency, and be economically beneficial.[2] A retrospective study by Roberts et al[4] showed that implementation of a DOTR led to a reduction in after-hours surgery, decreased time to OR, decreased length of stay (LOS), and an overall decrease in morbidity and mortality in patients with femoral neck fractures. Bhattacharyya et al[1] showed that hip fracture surgery done after-hours was associated with increased complication rates and that implementation of a DOTR led to a 72% reduction in the number of hip fracture surgery cases performed after-hours. Wixted et al[6] showed that implementation of a DOTR led to a 16% decrease in after-hours surgery despite a 14% increase in trauma volume. Since its inception, the DOTR model has provided consistent evidence of its ability to improve orthopaedic trauma care delivery in the tertiary care setting.

The majority of the studies focused on the DOTR model have evaluated full daytime DOTRs at tertiary centers. However, many community level trauma centers take care of considerable orthopaedic trauma as well; specifically geriatric hip fractures which are known to benefit from early daytime surgical intervention.[4,5,7,11-13] Community centers may be hesitant to dedicate resources to a full daytime DOTR as it requires enough cases to reap the benefits.[5] As a potential solution, our institution implemented a part-time DOTR from 6am-9am Monday through Friday. Although hybrid trauma room models have been discussed,[2] to our knowledge this is the first study to evaluate a part-time DOTR in a community level II hospital setting. Our

model is unique in two aspects: first, it is a part-time DOTR, and second, it is at a community level II trauma center. We present a retrospective study comparing outcomes of elderly hip fracture surgeries performed 12 months before and 12 months after the implementation of a daily 6am-9am DOTR. Our primary objectives were to determine the effect this DOTR model had on the percentage of cases that were performed after-hours and on time from admission to the OR. Our secondary objectives were to compare short-term patient outcomes including time to therapy, 90-day complications, mortality, transfusion rates, intensive care unit admissions (ICU), and LOS. Our hypothesis was that the implementation of a part-time DOTR would lead to a decrease in the number of after-hours surgeries and a decrease in time from admission to the OR. An additional secondary outcome was to compare the same outcomes in patients who were treated after-hours to those treated during the day.

MATERIALS AND METHODS

DOTR Model

We performed an Institutional Review Board (IRB) approved retrospective cohort study of all surgical hip fracture cases performed at an American College of Surgeons (ACS) verified level II trauma center. The study reviewed two consecutive 12 month time periods; the first from January 1 to December 31 of 2018, and the second from January 1 to December 31 of 2019. The 6–9am DOTR went into effect starting January 1, 2019 and was available Monday through Friday. The DOTR was reserved for urgent inpatient orthopaedic trauma.

Twenty-three orthopaedic surgeons took call and performed hip fracture cases during the study time period. Our hospital does not employ a dedicated orthopaedic trauma surgeon; therefore, the surgeons included a mix of private practice and hospital employees with various

subspecialties. The specific 6am-9am time block was chosen with the idea that the surgeon could use this time to complete a case before clinic or prior to the start of their elective operative day. Hip fractures encompassed the majority of cases performed in the room, but it was also used for any trauma cases in which early fixation is recommended (i.e. femoral shaft fractures, tibial shaft fractures, unstable ankle fractures, etc.). Due to the limited time allotted for the room, only one case was able to be booked into the room per day as that room usually had elective cases scheduled after the trauma block ended. Prior to implementation of the DOTR, fracture cases typically had to be added on to the end of the OR day or fit into the schedule between elective cases.

Patient Groups

We investigated outcomes of hip fracture patients who underwent surgical intervention during the study time frame including femoral neck, intertrochanteric and subtrochanteric femur fractures. This population was chosen due to their frequency and known benefit from early surgical stabilization.[7,12,14-16] Our inclusion criteria were patients ≥ 65 years old, low energy mechanism of injury, surgical intervention including cannulated screw fixation, cephalomedullary nailing (CMN), dynamic hip screw, hemiarthroplasty, or total hip arthroplasty (THA). Exclusion criteria were patients <65 years old, tumor-related pathologic fractures, periprosthetic fractures, multiple orthopaedic injuries, and high energy mechanisms.

A list of all hip fracture patients ≥ 65 years old during the study time period was provided by our trauma registry totaling 472 patients. Of these, 211 presented in 2018 (pre-DOTR) and 261 presented in 2019 (post-DOTR). A total of 23 patients were excluded from the pre-DOTR

group and 18 from the post-DOTR group (Table 1). This left a total of 431 patients who met our final inclusion criteria.

Outcome Variables

A thorough retrospective chart review of these patients was performed to record variables of interest including: time of admission, age, sex, comorbidities, injury severity scores (ISS), fracture laterality, OTA classification, time and date of surgery, type of surgery, duration of surgery, type of anesthesia, transfusion rates (preoperative, intraoperative and postoperative), time to physical therapy (PT) or occupational therapy (OT), LOS, intensive care unit (ICU) days, and 90-day complications. 90-day complications included: new skin ulcers, pneumonia (PNA), deep vein thrombosis (DVT), pulmonary embolism (PE), surgical site infection (SSI), cardiopulmonary events, revision surgery, readmission and mortality. Comorbidities included coagulopathy, cerebrovascular accident, atrial fibrillation, congestive heart failure, chronic obstructive pulmonary disease or current smoker, and history of cardiac stents. 90-day complications were recorded into Microsoft Excel using our electronic medical record system. If there was insufficient documentation to determine if a complication occurred, then the patient was excluded from the analysis for that particular complication. The electronic medical record provided access to all hospitals in the same hospital system and two nearby hospital systems. It did not include access to the private practice office records. Cases that started between 5:00pm and 5:30am were considered as after-hours. The patients that received surgery greater than 48 hours after their admission were also noted because all trauma centers are evaluated based on that interval for hip fractures by the ACS. This is due to the significant improvement in patient outcomes if hip fracture surgery is performed within 48 hours.[7,12-16]

Our primary outcome measure was comparing the number of after-hours surgeries and time from admission to the operating room between our pre-DOTR group and post-DOTR group. However, we also performed the same analysis excluding patients who were admitted on Friday and Saturday from both groups. This was done because the DOTR was not available on the day immediately after admission (Saturdays or Sundays). Finally, we examined the same outcome variables in patients who were treated after-hours during the 2 years compared to those treated during the day.

Statistical Analysis

Categorical data from the patient groups are presented as counts and percentages. Between-group comparisons were made using the chi-squared test for independence or Fisher's exact test. Continuous data are presented as mean averages with corresponding standard deviations (SD), and analyzed using t-tests for independent variables. If the conditions for parametric analysis could not be assumed, data are presented as median averages with the corresponding range and compared using the Mann-Whitney U test. Throughout this study, p-values ≤ 0.05 (two-tail) were considered statistically significant. Following initial data entry using Microsoft Excel, Minitab version 19 Statistical Software (State College, PA) was used for performing the analyses.

RESULTS

A total of 431 patients met our inclusion criteria and received surgical fixation for a low energy hip fracture from January 1, 2018 to December 31, 2019. Interestingly, the number of surgical hip fractures increased from 2018 to 2019 by 24% (Table 1). The patients were

classified into two groups for each set of outcome variables. The first set compared the pre-DOTR (n=188) and the post-DOTR (n=243) patients. The second set excluded patients who were admitted Friday and Saturday, with 46 excluded from the pre-DOTR group (n = 142) and 59 patients excluded from the post-DOTR group (n=184). A total of 66 (27.2%) cases were performed in the 6am-9am trauma room in 2019. The third set compared all daytime cases (n=330) to all after-hours cases (n=101). There was no significant difference between the groups in average age, sex, number of comorbidities, ISS score, or laterality of fracture (Table 2). Likewise, there was no significant difference between the groups regarding type of surgery or type of anesthesia (Table 3).

Number of Cases Performed After-Hours

A significant decrease in the number of after-hours surgeries was observed after implementation of the DOTR in the Friday and Saturday exclusion group, with the pre-DOTR group having 46 surgeries (32.4%) compared to 36 surgeries (19.6%) in the post-DOTR group (*P*=0.008). When looking at all data, there was a decrease in after-hours surgery in the post-DOTR group compared to the pre-DOTR group (21.0% vs 27.1%, respectively), although the difference was not significant (Table 4).

Time to OR

There was no significant difference across all groups when looking at time from ED admission to surgery (Table 4). In comparing pre-DOTR patients to post-DOTR patients, median time to surgery was 27.7 hours and 27.5 hours, respectively. When excluding Friday and Saturday patients, the pre-DOTR group was 27.1 hours and post-DOTR group was 27.4 hours. In

the third group, patients treated after-hours had a median time to surgery of 28.3 hours while patients treated during the daytime had a time of 27.0 hours. Similarly, there was no statistical difference in the number of cases performed after 48 hours across all groups (Table 4).

Surgical Time

Surgeries performed after-hours were significantly longer compared to surgeries performed during the daytime. After-hours surgery had an average time of 82.0 minutes (range 23 - 286 minutes) compared to the average daytime surgical length of 68 minutes (range 18 - 273 minutes) (P=0.003). Average length of surgery was almost identical when comparing overall pre-DOTR times to post-DOTR times (Table 4).

Time to Therapy

Patients treated after the implementation of the DOTR had a significantly longer time from surgery to therapy. When looking at all data, the pre-DOTR time from surgery to PT was 18.2 hours compared to 20.9 hours for patients in the post-DOTR group (P<0.001). The difference was even longer in the Friday and Saturday exclusion group, with an average pre-DOTR time of 17.9 hours compared to post-DOTR time of 21.5 hours (P<0.001). Lastly, hip fractures treated during the daytime had a significantly longer average time to therapy compared to patients treated after-hours (20.5 hours vs 14.4 hours, respectively; P<0.001).

ICU Transfers, LOS and Transfusion Rates

There were significantly fewer patients requiring transfer to the ICU postoperatively after the DOTR was implemented. In the Friday and Saturday exclusion group, the percentage of

patients requiring post-op ICU transfer in the pre-DOTR was 7.0% compared to 3.8% of patients in the post-DOTR group (*P*=0.036). There was no difference in patients requiring ICU transfer between the daytime and after-hours group. No significant differences were noted among the groups when looking at patients' average LOS or number of transfusions received (Table 4).

Morbidity and Mortality

After-hours patients had significantly higher rates of 90-day complications compared to those treated during the daytime. Pneumonia, pulmonary embolism and surgical site infection were all significantly higher in patients who had after-hours surgery (*P*= 0.002, 0.047, 0.024, respectively; Table 5). Though not significant, DVT rates and cardiopulmonary complications were higher in the after-hours group as well. The 90-day mortality rate in the after-hours group was 14.3% compared to 11.6% in the daytime group, however, this was not significant. There was no significant difference between 90-day complications and mortality when comparing the pre and post DOTR groups (Table 5).

DISCUSSION

The benefits of a DOTR at tertiary care centers have been clearly demonstrated in the literature.[1-10] This DOTR model has been a response to the unique urgent but not emergent nature of orthopaedic trauma. Hip fracture patients represent this challenge well as they have been shown to benefit from early fixation.[7,12-16] While early fixation is crucial to hip fracture patients, it must be balanced with quality care, which has been shown to be negatively affected by after-hours surgery.[1,6,8,11,17] Although the DOTR model has helped improve care in tertiary

centers, and hybrid DOTR models are emerging in various surgical care environments,[2] these evolving models have received limited attention in the literature.

This retrospective review of a part-time DOTR at a community level II trauma center has shown that implementation is both feasible and beneficial. Despite a 24% increase in hip fracture volume after the implementation of the DOTR, the number of after-hours surgeries was significantly decreased by 12.8% (P=0.008). This was accomplished without significantly increasing the time from the ED to surgery or the number of surgeries performed after 48 hours of admission. In addition, the number of ICU days were significantly decreased after the implementation of the DOTR (P=0.036). While the exact reasoning for fewer ICU days is not apparent, it may represent patient care teams being more comfortable monitoring patients on the floor during the day after an early surgery.

Interestingly, we found that the average time from surgery to PT or OT was significantly longer after the DOTR was implemented and for those who had surgery during the day. This was surprising and led us to discover that the therapy department had a policy of not seeing patients on the same day as surgery. Moving forward, this will lead to quality improvement by coordinating fracture patients treated early in the day with our therapists for early mobility. Theoretically, this could lead to further improvement in outcomes with the DOTR in place as formalized therapy programs have been shown to lead to improved fall prevention and functional outcomes.[17]

Multiple studies have demonstrated the deleterious effects that after-hours cases have on patient outcomes. Ricci et al[11] showed that patients who underwent tibial and femoral nailing after-hours had higher rates of unplanned reoperation than those treated during the day. Similarly, Bhattacharyya et al[1] showed that hip fracture patients treated after-hours had

significantly longer OR time and surgical complications compared to daytime treatment. Chacko et al[8] showed that hip fracture patients treated after-hours had longer duration of surgery and subsequently more blood loss. Our study demonstrates significantly longer duration of surgery when performed after-hours (average 82 minutes vs. 68 minutes, P=0.003) as well as higher rates of SSI (P=0.024), pneumonia (P=0.002), and PE (P=0.047). The reasons for negative outcomes with after-hours cases are likely to be multifactorial but it has been shown that surgeons on call or who are sleep deprived have decreased dexterity.[18] With 33% of medical errors attributed to fatigue,[19] it is important to strive to decrease the number of after-hours cases if possible. It is important to also recognize that late-night fatigue is not limited to the surgical staff but also anesthesia staff which in turn could potentially lead to adverse outcomes. In addition to negative patient outcomes, the disruption of a provider's family life, increased liability and limited payment of uninsured patients, have led many orthopaedic surgeons to not want to take call.[20] With an aging population, there will likely be an increased number of patients with hip fractures, so improvement in our care model is expected to become increasingly important. Thus, the benefits of having a DOTR for decreasing the number of after-hours surgeries also benefits the system, the provider, and most importantly, the patient.[2]

An inherent limitation of our study is that it was retrospective, and as such, multiple variables could not be controlled. In particular, 90-day complications were recorded using our hospital EMR. Some patients may have followed up outside of our hospital system with a complication that we were not able to record. Additionally, our evaluation of patient risk factors could have been improved by using frailty scores, Charelson index and ASA scores rather than number of comorbidities and ISS scores. Future studies may consider using these scores to improve their methodology. Another limitation is that our institution does not have a trauma

trained orthopaedic surgeon. While this is a limitation in one sense, this may increase the study's external validity and generalizability; our surgical staffing closely resembles that typically seen at many other community hospitals who may not have orthopaedic traumatologists on staff. Lastly, we did not perform a detailed cost analysis to determine if this model is financially beneficial. A cost benefit analysis would be unique for each center and depend on multiple variables including trauma volume, staffing and OR utilization. Since the study period, our institution has implemented a plan to have an alternating morning/afternoon part-time DOTR to increase utilization rates. This change was based on requests of staff orthopaedic surgeons who did not wish to use the early morning block. While a formal cost analysis was not performed, the average cost of an ICU day at our institution is $1085 and the average cost per minute of OR time is $45.13. Significant cost reduction for the system could result if other variables were investigated and accounted for.

Conclusion

While the benefits of the DOTR model have clearly been demonstrated at tertiary care centers, emerging hybrid models across other health care environments have received limited attention in the literature. Our study demonstrates that a part-time DOTR at a community level II trauma center can decrease the number of after-hours cases and ICU stays. Additionally, this study supports previously published literature demonstrating negative outcomes associated with hip fracture in patients treated after-hours compared to daytime.

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Table 1. Excluded Patients. Total Number of Patients, Number of Patients Excluded from the Study and Reasoning for Exclusion in the Pre-DOTR and Post-DOTR Groups. Percent increase in patients from Pre-DOTR to Post-DOTR.

	Pre-DOTR (%)	**Post-DOTR (%)**	**Percent Increase**
Total Number of Patients	211	261	24%
Number of Patients Excluded	23 (10.9)	18 (6.5)	
Patients Excluded due to:			
Transfer	1 (0.5)	1 (0.4)	
Periprosthetic	4 (1.9)	3 (1.1)	
GT Fracture Treated Non-OP	7 (3.3)	8 (3.1)	
Non-Operative / Hospice Care	5 (2.4)	5 (1.9)	
Concomitant Injuries	6 (2.8)	1 (0.4)	

DOTR: Dedicated Orthopaedic Trauma Room.

Table 2. Patient Demographics. Age, Sex, Number of Comorbidities, Injury Severity Score, Side of Fracture and OTA Classification

	All Patients			Excluding Friday and Saturday			Treatment Time		
	Pre-DOTR (N=188)	**Post-DOTR (N=243)**	***P***	**Pre-DOTR (N=142)**	**Post-DOTR (N=184)**	***P***	**After-Hours (N=101)**	**Daytime (N=330)**	***P***
Age									
Avg (SD)	83.6 (8.20)	83.2 (7.99)	0.59	83.81 (8.04)	83.44 (8.04)	0.68	83.58 (8.2)	83.27 (8.04)	0.73
Range	65-101	65-101		65-100	65-101		66-101	65-101	
Sex									
Male (%)	50 (26.6)	75 (30.9)	0.33	36 (25.4)	54 (29.3)	0.40	68 (77.2)	228 (69.1)	0.16
Female (%)	138 (73.4)	168 (69.1)		107 (75.4)	130 (70.7)		23 (22.8)	102 (30.9)	
Comorbidities (%)									
0	101 (53.7)	127 (52.3)		76 (53.5)	101 (54.9)		51 (50.5)	177 (53.6)	
1	72 (38.3)	82 (33.7)	0.19	55 (38.7)	63 (34.2)	0.518	43 (42.6)	111 (33.6)	0.12
2	12 (6.3)	29 (11.9)		8 (5.6)	18 (9.8)		6 (5.9)	35 (10.6)	
3	2 (1.1)	5 (2.1)		2 (1.4)	2 (1.1)		0 (0)	7 (2.12)	
4	1 (0.53)**	0 (0)		1 (0.7)**	0 (0)		1 (1.0)**	0 (0)	
ISS (%)	Avg 9.29	Avg 9.34		Avg 9.27	Avg 9.30		Avg 9.29	Avg 9.33	
9	147 (78.2)	182 (74.9)		112 (78.8)	140 (76.1)		75 (74.3)	254 (77.0)	
10	38 (20.2)	49 (20.2)	0.136	28 (19.7)	36 (19.6)	0.20	23 (22.8)	64 (19.4)	0.75
11	1 (0.5)	10 (4.1)		1 (0.7)	7 (3.8)		3 (3.0)	8 (2.4)	
>13	2 (1.1)	2 (0.8)		1 (0.7)**	1 (0.5)**		0 (0)	4 (1.2)**	
Side of Fracture									
Right (%)	94 (50.0)	109 (44.9)	0.289	68 (47.9)	83 (45.1)	0.62	49 (49.0)	154 (47.0)	0.75
Left (%)	94 (50.0)	134 (55.1)		74 (52.1)	101 (54.9)		52 (51.0)	176 (53.0)	
Classification (OTA)									
31A1	52 (27.7)	51 (21.0)		36 (25.4)	38 (20.7)		20 (19.8)	84 (25.5)	
31A2	28 (14.9)	43 (17.7)		19 (13.4)	30 (16.3)		15 (14.9)	56 (17.0)	
31A3	10 (5.3)	19 (7.8)		8 (5.6)	16 (8.7)		9 (8.9)	20 (6.1)	
31B 1.1 & 1.2	21 (11.2)	36 (14.8)	-	17 (12.0)	31 (16.8)	-	11 (10.9)	46 (13.9)	-
31B1.3	40 (21.3)	11 (4.5)		30 (21.1)	7 (3.8)		13 (12.9)	37 (11.2)	
31B2	25 (13.3)	40 (16.5)		21 (14.8)	30 (16.3)		22 (21.8)	43 (13.0)	
31B3	9 (4.8)	41 (16.9)		8 (5.6)	30 (16.3)		10 (9.9)	41 (12.4)	
32A1	3 (1.6)	2 (0.8)		3 (2.1)	2 (1.1)		1 (1.0)	3 (0.9)	

DOTR: Dedicated Orthopedic Trauma Room. *P*: P-Value. SD: Standard Deviation. Avg: Average. ISS: Injury Severity Score. OTA: Orthopedic Trauma Association.

*Significant (*P*<0.05); **Omitted small n to make statistical calculation valid; - Not calculated

Table 3. Surgical Course Summary. Type of Surgery and Type of Anesthesia for All Patients in the Pre-DOTR and Post-DOTR Groups, Patients Treated in the Pre-DOTR and Post-DOTR Groups Excluding Friday and Saturday and for Patients Treated After-Hours and Treated During the Daytime.

	All Patients			**Excluding Friday and Saturday**			**Treatment Time**		
	Pre-DOTR (N=188)	**Post-DOTR (N=243)**	***P***	**Pre-DOTR (N=142)**	**Post-DOTR (N=184)**	***P***	**After-Hours (N=101)**	**Daytime (N=330)**	***P***
Type of Surgery N (%)									
Cephalomedullary Nail	92 (48.9)	113 (46.5)		66 (46.5)	85 (46.2)		45 (44.6)	160 (48.5)	
Dynamic Hip Screw	6 (3.2)	7 (2.9)		4 (2.8)	5 (2.7)		4 (4.0)	9 (2.7)	
Cannulated Screws	21 (11.2)	36 (14.8)	0.83	17 (12.0)	30 (16.3)	0.87	11 (10.9)	46 (13.9)	0.71
Hemiarthroplasty	65 (34.6)	82 (33.7)		53 (37.3)	61 (33.2)		38 (37.6)	109 (33.0)	
Total Hip Arthroplasty	4 (2.1)	5 (2.1)		2 (1.4)	3 (1.6)		3 (3.0)	6 (1.8)	
Type of Anesthesia N (%)									
General	156 (83.0)	211 (86.8)	0.61	119 (83.8)	158 (85.9)	0.27	92 (91.1)	276 (83.6)	0.064
Spinal	32 (17.0)	32 (13.2)		23 (16.2)	26 (14.1)		9 (8.9)	54 (16.4)	

DOTR: Dedicated Orthopedic Trauma Room. *P*: P-Value.

Table 4. Surgical Course Data. Time from the Emergency Department to Surgery, After-Hours Cases, Surgeries Performed After 48 Hours, Duration of Surgery, Blood Transfusions, Time to Physical Therapy/Occupational Therapy, Length of Stay, and Days in Intensive Care Unit for the Pre-DOTR and Post-DOTR Groups for All Data and Data Excluding Friday's and Saturday's.

	All Data			**Excluding Friday and Saturday**			**Treatment Time**		
	Pre-DOTR (N=188)	**Post-DOTR (N=243)**	***P***	**2018 (N=142)**	**2019 (N=182)**	***P***	**After-Hours (N=101)**	**Daytime (N=330)**	***P***
Median Hrs from ED to Surgery (range)	27.7 (6.4-76.1)	27.5 (4.7-151.7)	0.40	27.1 (6.4-74.1)	27.4 (5.3-151.7)	0.20	28.3 (5.3-122.9)	27.0 (4.7-151.7)	0.74
Number of Cases Performed After-Hours (%)	51 (27.1)	51 (21.0)	0.46	46 (32.39)	36 (19.57)	**0.008***	NA		
Number of Cases Performed After 48 Hrs (%)	29 (15.4)	44 (18.1)	0.14	18 (12.68)	30 (16.30)	0.36	21 (20.8)	52 (15.8)	0.24
Median Duration of Surgery in minutes (range)	70.5 (18-286)	72.5 (18-273)	0.32	74.5 (18-286)	71.0 (20-273)	0.88	82.0 (23-286)	68 (18-273)	**0.003***
Number of Transfusions (%)									
0	119 (63.3)	167 (68.7)		88 (62.0)	123 (66.9)		63 (62.4)	223 (67.6)	
1	25 (13.3)	28 (11.5)	0.38	18 (12.7)	22 (12.0)	0.35	18 (17.8)	35 (10.6)	0.21
2	38 (20.2)	36 (14.8)		31 (21.8)	29 (15.8)		16 (15.8)	58 (17.6)	
3	4 (2.1)	8 (3.3)		4 (2.8)	7 (3.8)		4 (4.0)	8 (2.4)	
4	1 (0.5)	4 (1.65)		0 (0)	3 (1.6)		0 (0)	5 (1.5)	
5	1 (0.5)**	0 (0)		1 (0.7)**	0		0 (0)	1 (0.3)**	
Median Hrs to PT/OT (range)	18.17 (8.1-90.8)	20.87 (6.8-101)	**<0.001***	17.9 (8.1-90.8)	21.5 (6.6-101)	**<0.001***	14.4 (7.6-82.8)	20.5 (6.6-101)	**<0.001***
Avg LOS in days (SD)	4.84 (2.19)	4.91 (2.80)	0.065	4.96 (2.43)	5.36 (2.78)	0.17	5.24 (3.1)	5.04 (2.4)	0.55
Number of ICU Days (%)									
0	177 (94.2)	232 (95.5)		132 (93.0)	177 (96.2)		96 (95.1)	313 (94.9)	
1	4 (2.1)	1 (0.4)	0.11	3 (2.1)	2 (1.1)	**0.036***	1 (1.0)	4 (1.2)	0.98
2	2 (1.1)	2 (0.8)		2 (1.4)	4 (2.2)		1 (1.0)	3 (0.9)	
4	3 (1.6)	4 (1.7)		3 (2.1)	0 (0)		2 (2.0)	2 (0.6)	
5	1 (0.5)**	1 (0.4)		1 (0.7)**	0 (0)		1 (1.0)	3 (0.9)	
7	1 (0.5)**	1 (0.4)**		1 (0.7)**	1 (0.5)**		0 (0)	1 (0.6)**	
15	0 (0)	2 (0.8)**		0 (0)	0 (0)		**	**	

DOTR: Dedicated Orthopaedic Trauma Room. *P*: P-Value. Hrs: Hours. ED: Emergency Department. NA: Not Applicable. PT: Physical Therapy. OT: Occupational Therapy. Avg.: Average. LOS: Length of Stay. SD: Standard Deviation. ICU: Intensive Care Unit.

***Significant (P<0.05); **Omitted small n to make statistical calculation valid.**

Table 5 90 Day Post-Operative Complications. Type of Complications within 90 Day Post-Operative Period, Number of Cases with Revision Surgery, Readmission to the Hospital and Mortality Rate in the Pre-DOTR and Post-DOTR Groups for All Patients, Patients Excluding Friday and Saturday, and Patients Treated After Hours and During the Daytime.

	All Data			**Excluding Friday and Saturday**			**Treatment Time**		
	Pre-DOTR (N=188)	**Post-DOTR (N=243)**	***P***	**Pre-DOTR (N=142)**	**Post-DOTR (N=184)**	***P***	**After-Hours (N=101)**	**Daytime (N=330)**	***P***
Complications/N (%)									
Skin Ulcer	12/167 (7.19)	13/197 (6.60)	0.83	8/126 (6.35)	8/150 (5.33)	0.72	4/89 (4.49)	21/275 (7.64)	0.47
PNA	13/168 (7.74)	13/197 (6.60)	0.67	12/127 (9.45)	9/150 (6.00)	0.28	13/90 (14.44)	13/275 (4.73)	**0.002***
DVT	6/166 (3.61)	5/197 (2.54)	0.56	3/125 (2.40)	3/150 (2.00)	1.0	4/89 (4.49)	7/274 (2.55)	0.47
PE	1/166 (0.60)	3/197 (1.52)	0.63	1/125 (0.80)	2/150 (1.33)	1.0	3/89 (3.37)	1/274 (0.36)	**0.047***
SSI	5/166 (3.01)	3/197 (1.52)	0.48	3/125 (2.40)	3/150 (2.00)	1.0	5/89 (5.62)	3/274 (1.09)	**0.024***
Cardiopulmonary	22/168 (13.1)	26/199 (13.07)	0.99	17/126 (13.49)	19/151 (12.58)	0.82	15/91 (16.48)	33/276 (11.96)	0.27
Revision Surgery	3/166 (1.81)	7/240 (2.92)	0.54	3/125 (2.40)	5/182 (2.75)	1.0	2/95 (2.11)	8/311 (2.57)	1.0
Readmission to Hospital	47/167 (28.14)	51/239 21.34)	0.12	34/126 (26.98)	36/183 (19.67)	0.13	29/96 (30.21)	69/310 (22.26)	0.11
Mortality	19/159 (11.95)	26/207 (12.56)	0.86	16/118 (13.56)	17/154 (11.04)	0.53	13/91 (14.29)	32/275 (11.64)	0.51

DOTR: Dedicated Orthopaedic Trauma Room. *P*: P-Value. PNA: Pneumonia. DVT: Deep Vein Thrombosis. PE: Pulmonary Embolism. SSI: Surgical Site Infection

***Significant (P<0.05)**