

The difference between predicted and actual time in the operation theatre

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Abstract— Most of the surgeons in the operating room underestimate the time they are going to take on a procedure because they believe that the operation will go smoothly. The difference between the predicted time and the actual time for the surgery are caused by poor preoperative management of the patient and the lack of proper caseload assignment to the surgeons. The data was collected from King Salman Hospital in Riyadh, Saudi Arabia from a sample size of 97. The specialties selected for inclusion were ENT, General surgery, Ob/Gyne, Ophthalmology, Orthopedic, Pedia Surgery, Spinal, and Urology. The data was then analyzed with the use of SPSS. The orthopedic department showed a variation of 4943.72 minutes that is a variation of 179.24% between the predicted time and the actual time. General surgery follows close with a difference in the variation as 2152.36 minutes, which gives a variation of 128% and spinal having the highest relative difference of 204% in variation between the predicted and actual time.

Index Terms— Actual Time, Predicted time, Underestimate, Variation.

1 INTRODUCTION

THE predicted and the actual time in the operating room differ, as the activities done in the OR are not usually time fixed.

This means that some of the operations and activities cannot be measured exactly on how much time it takes to finish the activities since the time predicted does not account for any complications that may occur¹. According to Sanford et al, most of the surgeons in the operating room underestimate the time they are going to take on a procedure because they believe that the operation will go smoothly². According to the authors, nearly 93% of surgeons go into the operating room knowing that there will be no mishaps and that all activities will be done as per the standard processes formulated. According to Jain et al, more than 90% of surgeries take more time due to unexpected issues in the operating room or preoperative delays³. From the study by Antognini et al, only 24% of surgeries go without mishaps or any complications. It is only these small number of surgeries that meet the predicted time of completion⁴.

Levin & Tan explain that poor preoperative management of the patient and the lack of proper caseload assignment to the sur-

geons leads to the difference between the predicted time and the actual time for the surgery⁵. Tired staff who work shift after shift in the operating room become slower as more of the operations are being done and this leads to delays and mistakes that contribute to the lengthened operations⁶.

Luthra et al shows that different research has concluded that the average underestimated time for most surgeons is 31 minutes. This means that most surgeons are bound to underestimate the time taken to handle a procedure by 31 minutes⁷. One of the main procedures in the operating room is the administration of anesthesia. The authors show in their study that most of surgeons delay the procedure by more than 5 minutes, which is a major contributor to the final predicted time of the operation⁸. Different types of surgeons are also shown to have a poor prediction time such as orthopedic surgeons who are shown by Povoski et al to underestimate their time in operations by 16 minutes. Plastic surgeons had a variation of predicted and actual time of 29%, anesthetics had a variation of 41%, and orthopedic surgeons had the highest variation of the two periods by over 70%⁹.

¹ Casser, J *Perioperative care and operating room management*. (2016). New York: Elsevier Inc

² Sanford, J. A., Kadry, B., Brodsky, J. B., & Macario, A. Bariatric Surgery Operating Room Time—Size Matters. *Obesity Surgery*, 2015. 25, 6, 1078-1085.

³ Jain, Avish L, Jones, Kerwyn C, Simon, Jodi, & Patterson, Mary D. *The impact of a daily pre-operative surgical huddle on interruptions, delays, and surgeon satisfaction in an orthopedic operating room: a prospective study*. (BioMed Central Ltd.) 2015 BioMed Central Ltd.

⁴ Antognini, Joseph, Antognini, Joseph, & Khatri, Vijay. *How many operating rooms are needed to manage non-elective surgical cases? A Monte Carlo simulation study*. (BioMed Central Ltd.) 2015 BioMed Central Ltd.

⁵ Levin, D., & Tan, S.. Black box audio/video recording in the operating room: time for anesthesiologists to get with the picture. *Canadian Journal of Anesthesia/journal Canadien D'anesthésie*, August 31, 2015. 62, 8, 937-938.

⁶ Tighe, S. M. *Instrumentation for the operating room: A photographic manual*. 2015 St. Louis: Mosby

⁷ Luthra, S., Ramady, O., Monge, M., Fitzsimons, M. G., Kaleta, T. R., & Sundt, T. M. "Knife to Skin" Time Is a Poor Marker of Operating Room Utilization and Efficiency in Cardiac Surgery. *Journal of Cardiac Surgery*, 2015. 30, 6, 477-487.

⁸ Cochran, A., & In Braga, R. *Introduction to the operating room*. 2017

⁹ Povoski, Stephen P, Hall, Nathan C, Murrey, Douglas A, Wright, Chadwick L, & Martin, Edward W. *Feasibility of a mul-*

2 METHODS

2.1 Process

The heads of the department of each specialty in King Salman Hospital in Riyadh, Saudi Arabia was vital in ensuring the approval of the study. The participants in the study chosen were 97 in number and were from the main departments of King Salman Hospital, which are: ENT, General surgery, Ob / Gyne, Ophthalmology, Orthopedic, Pedia Surgery, Spinal, and Urology. The heads of the departments in each department were only notified of the research that was being undertaken however, they were not told of the type of data that was being collected and which procedures were to be used. This was done to prevent the surgeons from influencing the results. Both elective and emergency theatre lists were chosen at random. The collection of data was done by asking the surgeons of how long they think the procedure will take. This was then recorded as the estimated time. Before the procedure began, the preoperative procedures included certain activities that were all included in the actual time taken for the procedure. The operating time included all preoperative processes such as skin preparation and preparation of tools in the OR. Once the actual time was recorded the results were compared and were used to come up with conclusions on the variation between the predicted time in the OR and the actual time for operations.

2.2 Statistical Methods

The analysis of the data was done using SPSS (IBM) statistical software together with analysis of variance and post hoc Games-Howell tests. The mean actual time was the time recorded for the real time taken for the operation to end. The mean predicted time was collected from all specialties as well as the relative mean percentage difference between actual and predicted times. These were the main variables used for the analysis of the data.

Absolute and relative values of estimated and actual time difference				
Department	Mean (SD) Procedure Time (minutes)		Mean difference from Predicted	
	Actual	Predicted	Absolute difference (95% CI) (minutes)	Relative difference (%)
ENT	5596.36 (1027.07)	4227.18 (1293.71)	1424.45 (942.86 to 1906.05)	32.39
GENERAISURGERY	7690.91 (1596)	5571.45 (1138.33)	2152.36 (1637.35 to 2667.38)	38.04
OB / GYNE	948.00 (37.95)	415.70 (170.45)	532.30 (411.36 to 653.24)	128.05
OPHTHALMOLOGY	1930.91 (357.81)	1239.55 (571.73)	880.27 (688.27 to 1072.27)	55.77
ORTHOPEDIC	7701.82 (1244.55)	2758.09 (1324.31)	4943.72 (4216.79 to 5670.66)	179.24
PEDIA SURGERY	938.18 (226.53)	495.55 (193.27)	442.64 (323.36 to 561.91)	89.32
SPINAL	1032 (227.68)	338.50 (220.08)	693.50 (452.47 to 934.53)	204.87
UROLOGY	1963.64 (545.37)	1823.27 (644.43)	382.55 (262.18 to 502.91)	7.70
SPECIALTIES	1025.45 (430.54)	1242.55 (1011.14)	639.82 (213.84 to 1065.80)	17.47

3 Data Analysis

Table 1: Absolute and Relative Values of estimated and actual time difference

4 RESULTS

4.1 Descriptive statistics

On average, **ORTHOPEDIC** were found to underestimate by 4943.72 minutes (95 confidence interval 4216.79 to 5670.66), meaning that their procedures took longer than predicted, **GENERAL SURGERY** also underestimated by 2152.36 minutes (1637.35 to 2667.38), followed by **ENT** which underestimate by 1424.45 minutes (95 confidence interval 942.86 to 1906.05), followed by

OPHTHALMOLOGY which underestimate by 880.27 minutes (95 confidence interval 688.27 to 1072.27), followed by **SPINAL** which underestimate by 693.5 minutes (95 confidence interval 452.47 to 934.53), followed by **SPECIALTIES** which underestimate by 639.82 minutes (95 confidence interval 213.84 to 1065.80), followed by **OB/GYNE** which underestimate by 532.30 minutes (95 confidence interval 411.36 to 653.24), followed by **PEDIA SURGERY** which underestimate by 442.64

timodal 18F-FDG-directed lymph node surgical excisional biopsy approach for appropriate diagnostic tissue sampling in patients with suspected lymphoma. (BioMed Central Ltd.) 2015 BioMed Central Ltd.

minutes (95 confidence interval 323.36 to 561.91), and **UROLOGY** which was the most accurate, overestimated by minute 382.55 (95 confidence interval 262.18 to 502.91)

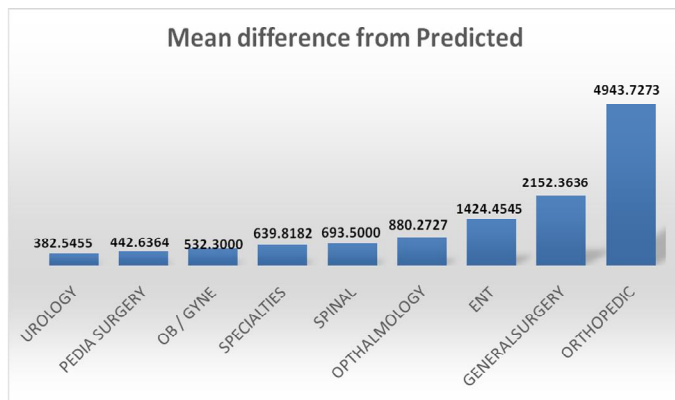


Fig. 1 Mean difference from predicted time

On relative difference, ENT underestimated by 32.39%, general surgery by 38.04%, OB/gyne by 128.05%, ophthalmology by 55.77%, orthopedic by 179.24%, pedia surgery by 89.32%, spinal by 204.87%, urology by 7.7%, and specialties by 17.47%.

4.2 Inferential statistics

Between group, one way analysis of variance reveals a significant effect of specialty on the observed difference between perceived and actual time ($F = 69.98$ with $P \text{ value} = 0.00 < 0.05$). The assumption of homogeneity of variance has been violated. Thus, Post hoc Games-Howell test was chosen which reveals that the observed time difference between ENT and (OB / GYNE, ORTHOPEDIC, PEDIA SURGERY, UROLOGY) is significantly different ($P=0.035, 0.00, 0.018, 0.012$). Likewise, there is a significant difference in the observed time difference between GENERALSURGERY and all other department except ENT in which p-value were < 0.05 . However, the observed time difference is not significantly different between GENERAL SURGERY and ENT since ($P= 0.387 > 0.05$). This is shown in (Appendix A).

5 Discussions

From the results that have been drawn, there are various inferences that can be made regarding the predicted and the actual time it takes for surgeons in the operating room. The SPSS analysis shows that the orthopedic department is the department with the most underestimated time of operations. The orthopedic department showed a variation of 4943.72 minutes that is a variation of 179.24% between the predicted time and the actual time. General surgery follows close with a difference in the variation as 2152.36 minutes, which gives a variation of 128%. Povoski et al (2015) in their studies show that the orthopedic surgeons and the general surgeons had the longest variation times in surgery, which is in relation to the study done.

However, the variation in percentage for the spinal was the highest with a variation of 204.87%. This is because the predicted time and the actual time had the largest variation between them

despite their numbers being low. For spinal, the absolute difference between the two times was 693.50, which seems low compared to general and orthopedic surgery. The variation however between the predicted time and actual time is much vast compared to the rest as the predicted time was 338.50 minutes and the actual time for the procedure was 1032 minutes.

This provides the biggest difference in the variation and hence spinal department shows it is the department with the most underestimated times of all the specialties. The least underestimated department is Urology where the variation between the predicted and the actual time is only 7.7%. The results show that in order to fully understand the variation between the two times presented, one needs to look at the variation percentage as this will provide all the information necessary to show how much the departments vary in their time frames. Therefore, from the procedures, it can be seen that the variation in the spinal department is the highest followed by orthopedic and general surgery. These are the highest underestimated times in the departments.

Barbagallo et al explain that the variation of most of the surgical operating rooms is mainly due to the activities that happen in the room¹⁰. Kaye et al in their study explain that the use of different operating procedures cause for 67% of delays in the operating room¹¹. This means that without a standard operating procedure, the surgeons in the operating room are bound to take time due to lack of planning. Pearson argues that OR management needs the support of the staff and the nurses that are helping the surgeon during operation. Proper support includes having nurses manage and have all equipment needed in the OR¹². According to AORN, lack of proper management delays the actual time of surgery by 46%. This means that the lack of planning on the equipment to be placed in the OR is necessary since once something is used, it is thrown away and cannot be reused¹³. When the supplies are less in the OR, it causes for delays and these are estimated to bring in a delay of 32% of cases on actual time of the operation¹⁴.

6 Limitations of Study

One of the main limitations of the study was the time taken to collect the data. This would have been done faster if there were assistants to help in the collection of the data. Collection of the data was done once due to this and this reduces the validity of the results, as there was no time in the collection of more information on the actual time that was taken during surgery. If there were

¹⁰ Barbagallo, Simone, Corradi, Luca, de Ville de Goyet, Jean, Iannucci, Marina, Porro, Ivan, Rosso, Nicola, Tanfani, Elena, ... Testi, Angela.. *Optimization and planning of operating theatre activities: an original definition of pathways and process modeling*. (BioMed Central Ltd.) 2015 BioMed Central Ltd.

¹¹ Kaye, A. D., Fox, C. J., & Urman, R. D. *Operating room leadership and management*. 2012

¹² Pearson, R. *The Red Room*. Journal of Meicine 2014 8, 34, 57-78

¹³ AORN, Conner, R., & AORN. *Guidelines for perioperative practice 2015*.

¹⁴ Criscitelli, T., & ebrary, Inc. *Fast facts for the operating room nurse: An orientation and care guide in a nutshell 2015*

assistants helping in taking the data, the actual times would have been compared and the best and closest time would have been used. Taking the data once therefore reduces its reliability.

Having more time and more references of the actual time taken to finish the operations would have prevented the assumption of homogeneity of variance¹⁵. The study had to use post hoc Games-Howell tests which showed that there was a difference in the observed time between the different specialties compared to the rest. The observed time of ENT and the rest (Ob / Gyne, Orthopedic, Pedia Surgery, Urology) is significantly different as the value of $p=0.035, 0.00, 0.018, 0.012$ respectively which should not be the case as the difference needs to be greater than the value 0.05. This is the main limitation to the study as the differences in time reduce the reliability and validity of the research.

7 Conclusion

The predicted time and the actual time for any operation are necessary, as they are different due to various elements that are present in the OR. The external factors such as poor planning and management lead to various delays in the procedures, which in turn lead to a larger variation of the actual time of operation and the predicted time. According to a study done by Povoski et al (2015), different specialties have different variation times. The study shows that Plastic surgeons had a variation of predicted and actual time of 29%, anesthetics had a variation of 41%, orthopedic surgeons had the highest variation of the two periods by over 70%, and general surgeons averaged a high percentage of more than 50%.

From the study done, the results are in line with the study done by Povoski et al (2015) where The orthopedic department showed a variation of 179.24% between the predicted time and the actual time, general surgery follows close with a difference in the variation as 2152.36 minutes which gives a variation of 128% and the highest variation being spinal which had a variation of 204%.

The results explain that the spinal specialty has the highest variation without having the highest mean difference between the predicted and the actual periods. This happens because the actual minute it takes for operations is lower but the variation is high. The actual time is seen to be 1032 minutes while the prediction time is given as 338.50. The number of minutes is lower than most of the specialties but the relative difference are high as it comes to 204%.

One of the main limitations of the study is the time taken to collect the data. There was no room to collect more data for comparison. This is an issue because the data collected is only one set and may have issues such as seen between the difference specialties in time. To rectify such a limitation, different sets of data need to be taken in order for comparison, which in turn leads to enhanced reliability.

¹⁵ Ono, Naomi, Nakahira, Junko, Sawai, Toshiyuki, Kuzukawa, Yosuke, & Minami, Toshiaki. *Effect of differences in extubation timing on postoperative care following abdominal aortic replacement surgery: a comparison study*. (BioMed Central Ltd.) 2015 BioMed Central Ltd.

REFERENCES

1. Antognini, Joseph, Antognini, Joseph, & Khatri, Vijay. (2015). *How many operating rooms are needed to manage non-elective surgical cases? A Monte Carlo simulation study*. (BioMed Central Ltd.) BioMed Central Ltd.
2. AORN,, In Conner, R., & AORN. (2015). *Guidelines for perioperative practice 2015*.
3. Barbagallo, Simone, Corradi, Luca, de Ville de Goyet, Jean, Iannucci, Marina, Porro, Ivan, Rosso, Nicola, Tanfani, Elena, ... Testi, Angela. (2015). *Optimization and planning of operating theatre activities: an original definition of pathways and process modeling*. (BioMed Central Ltd.) BioMed Central Ltd.
4. Casser, J (2016) *Perioperative care and operating room management*. (2016). New York: Elsevier Inc.
5. Cochran, A., & In Braga, R. (2017). *Introduction to the operating room*.
6. Criscitelli, T., & ebrary, Inc. (2015). *Fast facts for the operating room nurse: An orientation and care guide in a nutshell*
7. Jain, Avish L, Jones, Kerwyn C, Simon, Jodi, & Patterson, Mary D. (2015). *The impact of a daily pre-operative surgical huddle on interruptions, delays, and surgeon satisfaction in an orthopedic operating room: a prospective study*. (BioMed Central Ltd.) BioMed Central Ltd.
8. Kaye, A. D., Fox, C. J., & Urman, R. D. (2012). *Operating room leadership and management*.
9. Levin, D., & Tan, S. (August 31, 2015). Black box audio/video recording in the operating room: time for anesthesiologists to get with the picture. *Canadian Journal of Anesthesia/journal Canadien D'anesthésie*, 62, 8, 937-938.
10. Luthra, S., Ramady, O., Monge, M., Fitzsimons, M. G., Kaleta, T. R., & Sundt, T. M. (June 01, 2015). "Knife to Skin" Time Is a Poor Marker of Operating Room Utilization and Efficiency in Cardiac Surgery. *Journal of Cardiac Surgery*, 30, 6, 477-487.
11. Ono, Naomi, Nakahira, Junko, Sawai, Toshiyuki, Kuzukawa, Yosuke, & Minami, Toshiaki. (2015). *Effect of differences in extubation timing on postoperative care following abdominal aortic replacement surgery: a comparison study*. (BioMed Central Ltd.) BioMed Central Ltd.
12. Pearson, R. (2014). *The Red Room*. *Journal of Meicine* 8, 34, 57-78
13. Povoski, Stephen P, Hall, Nathan C, Murrey, Douglas A, Wright, Chadwick L, & Martin, Edward W. (2015). *Feasibility of a multimodal 18F-FDG-directed lymph node surgical excisional biopsy approach for appropriate diagnostic tissue sampling in patients with suspected lymphoma*. (BioMed Central Ltd.) BioMed Central Ltd.
14. Sanford, J. A., Kadry, B., Brodsky, J. B., & Macario, A. (June 24, 2015). Bariatric Surgery Operating Room Time—Size Matters. *Obesity Surgery*, 25, 6, 1078-1085.

15. Tighe, S. M. (2015). *Instrumentation for the operating room: A photographic manual*. St. Louis: Mosby.

Appendices

Appendix A

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Absolute difference

Games-Howell

(I) Department	(J) Department	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ENT	GENERALSURGERY	-727.90909-	316.45602	.387	-1823.8740-	368.0558
	OB / GYNE	892.15455*	222.65701	.035	52.5390	1731.7701
	OPHTHALMOLOGY	544.18182	232.68740	.386	-308.9940-	1397.3576
	ORTHOPEDIC	-3519.27273*	391.35579	.000	-4896.6810-	-2141.8645-
	PEDIA SURGERY	981.81818*	222.67386	.018	142.2531	1821.3833
	SPINAL	730.95455	240.97915	.135	-138.5226-	1600.4317
	UROLOGY	1041.90909*	222.79202	.012	202.2223	1881.5959
	SPECIALTIES	784.63636	288.56256	.203	-215.8665-	1785.1393
GENERALSURGERY	ENT	727.90909	316.45602	.387	-368.0558-	1823.8740
	OB / GYNE	1620.06364*	237.24371	.001	723.0620	2517.0653
	OPHTHALMOLOGY	1272.09091*	246.68170	.004	363.1667	2181.0151
	ORTHOPEDIC	-2791.36364*	399.83470	.000	-4192.1545-	-1390.5727-
	PEDIA SURGERY	1709.72727*	237.25953	.000	812.7665	2606.6880
	SPINAL	1458.86364*	254.51794	.001	535.5793	2382.1480
	UROLOGY	1769.81818*	237.37043	.000	872.7500	2666.8864
	SPECIALTIES	1512.54545*	299.96130	.002	470.2128	2554.8781
OB / GYNE	ENT	-892.15455*	222.65701	.035	-1731.7701-	-52.5390-
	GENERALSURGERY	-1620.06364*	237.24371	.001	-2517.0653-	-723.0620-
	OPHTHALMOLOGY	-347.97273-	101.40806	.062	-707.3278-	11.3823
	ORTHOPEDIC	-4411.42727*	330.60478	.000	-5673.8401-	-3149.0145-
	PEDIA SURGERY	89.66364	75.65591	.950	-173.8147-	353.1420
	SPINAL	-161.20000-	119.21039	.897	-597.4152-	275.0152
	UROLOGY	149.75455	76.00299	.579	-114.9065-	414.4156
	SPECIALTIES	-107.51818-	198.51579	1.000	-851.9158-	636.8794

OPHTHALMOLOGY	ENT	-544.18182-	232.68740	.386	-1397.3576-	308.9940
	GENERALSURGERY	-1272.09091-	246.68170	.004	-2181.0151-	-363.1667-
	OB / GYNE	347.97273	101.40806	.062	-11.3823-	707.3278
	ORTHOPEDIC	-4063.45455-	337.44156	.000	-5332.1273-	-2794.7818-
	PEDIA SURGERY	437.63636*	101.44505	.011	78.8607	796.4121
	SPINAL	186.77273	137.03430	.897	-294.1045-	667.6500
	UROLOGY	497.72727*	101.70416	.003	138.2888	857.1657
	SPECIALTIES	240.45455	209.70407	.956	-521.0930-	1002.0021
ORTHOPEDIC	ENT	3519.27273*	391.35579	.000	2141.8645	4896.6810
	GENERALSURGERY	2791.36364*	399.83470	.000	1390.5727	4192.1545
	OB / GYNE	4411.42727*	330.60478	.000	3149.0145	5673.8401
	OPHTHALMOLOGY	4063.45455*	337.44156	.000	2794.7818	5332.1273
	PEDIA SURGERY	4501.09091*	330.61613	.000	3238.6907	5763.4911
	SPINAL	4250.22727*	343.21178	.000	2974.2187	5526.2359
	UROLOGY	4561.18182*	330.69573	.000	3298.7225	5823.6411
	SPECIALTIES	4303.90909*	378.14247	.000	2960.3130	5647.5052
PEDIA SURGERY	ENT	-981.81818-	222.67386	.018	-1821.3833-	-142.2531-
	GENERALSURGERY	-1709.72727-	237.25953	.000	-2606.6880-	-812.7665-
	OB / GYNE	-89.66364-	75.65591	.950	-353.1420-	173.8147
	OPHTHALMOLOGY	-437.63636-	101.44505	.011	-796.4121-	-78.8607-
	ORTHOPEDIC	-4501.09091-	330.61613	.000	-5763.4911-	-3238.6907-
	SPINAL	-250.86364-	119.24186	.508	-686.7107-	184.9834
	UROLOGY	60.09091	76.05233	.996	-203.1701-	323.3519
	SPECIALTIES	-197.18182-	198.53468	.979	-941.5061-	547.1425
SPINAL	ENT	-730.95455-	240.97915	.135	-1600.4317-	138.5226
	GENERALSURGERY	-1458.86364-	254.51794	.001	-2382.1480-	-535.5793-
	OB / GYNE	161.20000	119.21039	.897	-275.0152-	597.4152
	OPHTHALMOLOGY	-186.77273-	137.03430	.897	-667.6500-	294.1045
	ORTHOPEDIC	-4250.22727-	343.21178	.000	-5526.2359-	-2974.2187-
	PEDIA SURGERY	250.86364	119.24186	.508	-184.9834-	686.7107
	UROLOGY	310.95455	119.46237	.269	-125.3153-	747.2244
	SPECIALTIES	53.68182	218.86827	1.000	-728.2724-	835.6360
UROLOGY	ENT	-1041.90909-	222.79202	.012	-1881.5959-	-202.2223-
	GENERALSURGERY	-1769.81818-	237.37043	.000	-2666.8864-	-872.7500-
	OB / GYNE	-149.75455-	76.00299	.579	-414.4156-	114.9065
	OPHTHALMOLOGY	-497.72727-	101.70416	.003	-857.1657-	-138.2888-
	ORTHOPEDIC	-4561.18182-	330.69573	.000	-5823.6411-	-3298.7225-
	PEDIA SURGERY	-60.09091-	76.05233	.996	-323.3519-	203.1701
	SPINAL	-310.95455-	119.46237	.269	-747.2244-	125.3153

SPECIALTIES		-257.27273-	198.66720	.914	-1001.7506-	487.2051
SPECIALTIES	ENT	-784.63636-	288.56256	.203	-1785.1393-	215.8665
	GENERA LSURGERY	-1512.54545-	299.96130	.002	-2554.8781-	-470.2128-
	OB / GYNE	107.51818	198.51579	1.000	-636.8794-	851.9158
	OPHTHALMOLOGY	-240.45455-	209.70407	.956	-1002.0021-	521.0930
	ORTHOPEDIC	-4303.90909-	378.14247	.000	-5647.5052-	-2960.3130-
	PEDIA SURGERY	197.18182	198.53468	.979	-547.1425-	941.5061
	SPINAL	-53.68182-	218.86827	1.000	-835.6360-	728.2724
	UROLOGY	257.27273	198.66720	.914	-487.2051-	1001.7506

*. The mean difference is significant at the 0.05 level.

SPSS Output

Actual

Department	Mean	N	Std. Deviation
ENT	5596.36	11	1027.066
GENERA LSURGERY	7690.91	11	1596.004
OB / GYNE	948.00	10	37.947
OPHTHALMOLOGY	1930.91	11	357.812
ORTHOPEDIC	7701.82	11	1244.555
PEDIA SURGERY	938.18	11	226.531
SPINAL	1032.00	10	227.684
UROLOGY	1963.64	11	545.367
SPECIALTIES	1025.45	11	430.543
Tota	3248.66	97	2899.116

Predicted

Department	Mean	N	Std. Deviation
ENT	4227.18	11	1293.707
GENERA LSURGERY	5571.45	11	1138.330
OB / GYNE	415.70	10	170.451
OPHTHALMOLOGY	1239.55	11	571.734
ORTHOPEDIC	2758.09	11	1324.314
PEDIA SURGERY	495.55	11	193.267
SPINAL	338.50	10	220.082
UROLOGY	1823.27	11	644.435
SPECIALTIES	1242.55	11	1011.137
Total	2046.14	97	1929.906

Oneway

Descriptives

Absolute_difference

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
ENT	11	1424.4545	716.86670	216.14344	942.8569	1906.0522	304.00	2779.00
GENERALSURGERY	11	2152.3636	766.60985	231.14157	1637.3481	2667.3791	181.00	2989.00
OB / GYNE	10	532.3000	169.06084	53.46173	411.3612	653.2388	208.00	726.00
OPHTHALMOLOGY	11	880.2727	285.79681	86.17098	688.2718	1072.2736	457.00	1411.00
ORTHOPEDIC	11	4943.7273	1082.06054	326.25353	4216.7891	5670.6654	3235.00	6558.00
PEDIA SURGERY	11	442.6364	177.54508	53.53186	323.3600	561.9128	124.00	780.00
SPINAL	10	693.5000	336.94155	106.55028	452.4665	934.5335	175.00	1408.00
UROLOGY	11	382.5455	179.16828	54.02127	262.1786	502.9123	65.00	712.00
SPECIALTIES	11	639.8182	634.07725	191.18149	213.8393	1065.7971	73.00	1864.00
Total	97	1358.5773	1503.46638	152.65388	1055.5618	1661.5929	65.00	6558.00

Test of Homogeneity of Variances

Absolute_difference

Levene Statistic	df1	df2	Sig.
5.439	8	88	.000

ANOVA

Absolute_difference

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	187522460.525	8	23440307.566	69.978	.000
Within Groups	29477009.145	88	334966.013		
Total	216999469.670	96			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Absolute_difference

Games-Howell

(I) Department	(J) Department	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ENT	GENERALSURGERY	-727.90909-	316.45602	.387	-1823.8740-	368.0558
	OB / GYNE	892.15455*	222.65701	.035	52.5390	1731.7701
	OPHTHALMOLOGY	544.18182	232.68740	.386	-308.9940-	1397.3576
	ORTHOPEDIC	-3519.27273*	391.35579	.000	-4896.6810-	-2141.8645-
	PEDIA SURGERY	981.81818*	222.67386	.018	142.2531	1821.3833
	SPINAL	730.95455	240.97915	.135	-138.5226-	1600.4317
	UROLOGY	1041.90909*	222.79202	.012	202.2223	1881.5959
	SPECIALTIES	784.63636	288.56256	.203	-215.8665-	1785.1393
GENERALSURGERY	ENT	727.90909	316.45602	.387	-368.0558-	1823.8740
	OB / GYNE	1620.06364*	237.24371	.001	723.0620	2517.0653
	OPHTHALMOLOGY	1272.09091*	246.68170	.004	363.1667	2181.0151
	ORTHOPEDIC	-2791.36364*	399.83470	.000	-4192.1545-	-1390.5727-
	PEDIA SURGERY	1709.72727*	237.25953	.000	812.7665	2606.6880
	SPINAL	1458.86364*	254.51794	.001	535.5793	2382.1480
	UROLOGY	1769.81818*	237.37043	.000	872.7500	2666.8864
	SPECIALTIES	1512.54545*	299.96130	.002	470.2128	2554.8781
OB / GYNE	ENT	-892.15455*	222.65701	.035	-1731.7701-	-52.5390-
	GENERALSURGERY	-1620.06364*	237.24371	.001	-2517.0653-	-723.0620-
	OPHTHALMOLOGY	-347.97273-	101.40806	.062	-707.3278-	11.3823
	ORTHOPEDIC	-4411.42727*	330.60478	.000	-5673.8401-	-3149.0145-
	PEDIA SURGERY	89.66364	75.65591	.950	-173.8147-	353.1420
	SPINAL	-161.20000-	119.21039	.897	-597.4152-	275.0152
	UROLOGY	149.75455	76.00299	.579	-114.9065-	414.4156
	SPECIALTIES	-107.51818-	198.51579	1.000	-851.9158-	636.8794
OPHTHALMOLOGY	ENT	-544.18182-	232.68740	.386	-1397.3576-	308.9940
	GENERALSURGERY	-1272.09091*	246.68170	.004	-2181.0151-	-363.1667-
	OB / GYNE	347.97273	101.40806	.062	-11.3823-	707.3278
	ORTHOPEDIC	-4063.45455*	337.44156	.000	-5332.1273-	-2794.7818-
	PEDIA SURGERY	437.63636*	101.44505	.011	78.8607	796.4121
	SPINAL	186.77273	137.03430	.897	-294.1045-	667.6500
	UROLOGY	497.72727*	101.70416	.003	138.2888	857.1657
	SPECIALTIES	240.45455	209.70407	.956	-521.0930-	1002.0021
ORTHOPEDIC	ENT	3519.27273*	391.35579	.000	2141.8645	4896.6810
	GENERALSURGERY	2791.36364*	399.83470	.000	1390.5727	4192.1545
	OB / GYNE	4411.42727*	330.60478	.000	3149.0145	5673.8401

	OPHTHALMOLOGY	4063.45455*	337.44156	.000	2794.7818	5332.1273
	PEDIA SURGERY	4501.09091*	330.61613	.000	3238.6907	5763.4911
	SPINAL	4250.22727*	343.21178	.000	2974.2187	5526.2359
	UROLOGY	4561.18182*	330.69573	.000	3298.7225	5823.6411
	SPECIALTIES	4303.90909*	378.14247	.000	2960.3130	5647.5052
PEDIA SURGERY	ENT	-981.81818-	222.67386	.018	-1821.3833-	-142.2531-
	GENERALSURGERY	-1709.72727-	237.25953	.000	-2606.6880-	-812.7665-
	OB / GYNE	-89.66364-	75.65591	.950	-353.1420-	173.8147
	OPHTHALMOLOGY	-437.63636-	101.44505	.011	-796.4121-	-78.8607-
	ORTHOPEDIC	-4501.09091-	330.61613	.000	-5763.4911-	-3238.6907-
	SPINAL	-250.86364-	119.24186	.508	-686.7107-	184.9834
	UROLOGY	60.09091	76.05233	.996	-203.1701-	323.3519
	SPECIALTIES	-197.18182-	198.53468	.979	-941.5061-	547.1425
SPINAL	ENT	-730.95455-	240.97915	.135	-1600.4317-	138.5226
	GENERALSURGERY	-1458.86364-	254.51794	.001	-2382.1480-	-535.5793-
	OB / GYNE	161.20000	119.21039	.897	-275.0152-	597.4152
	OPHTHALMOLOGY	-186.77273-	137.03430	.897	-667.6500-	294.1045
	ORTHOPEDIC	-4250.22727-	343.21178	.000	-5526.2359-	-2974.2187-
	PEDIA SURGERY	250.86364	119.24186	.508	-184.9834-	686.7107
	UROLOGY	310.95455	119.46237	.269	-125.3153-	747.2244
	SPECIALTIES	53.68182	218.86827	1.000	-728.2724-	835.6360
UROLOGY	ENT	-1041.90909-	222.79202	.012	-1881.5959-	-202.2223-
	GENERALSURGERY	-1769.81818-	237.37043	.000	-2666.8864-	-872.7500-
	OB / GYNE	-149.75455-	76.00299	.579	-414.4156-	114.9065
	OPHTHALMOLOGY	-497.72727-	101.70416	.003	-857.1657-	-138.2888-
	ORTHOPEDIC	-4561.18182-	330.69573	.000	-5823.6411-	-3298.7225-
	PEDIA SURGERY	-60.09091-	76.05233	.996	-323.3519-	203.1701
	SPINAL	-310.95455-	119.46237	.269	-747.2244-	125.3153
	SPECIALTIES	-257.27273-	198.66720	.914	-1001.7506-	487.2051
SPECIALTIES	ENT	-784.63636-	288.56256	.203	-1785.1393-	215.8665
	GENERALSURGERY	-1512.54545-	299.96130	.002	-2554.8781-	-470.2128-
	OB / GYNE	107.51818	198.51579	1.000	-636.8794-	851.9158
	OPHTHALMOLOGY	-240.45455-	209.70407	.956	-1002.0021-	521.0930
	ORTHOPEDIC	-4303.90909-	378.14247	.000	-5647.5052-	-2960.3130-
	PEDIA SURGERY	197.18182	198.53468	.979	-547.1425-	941.5061
	SPINAL	-53.68182-	218.86827	1.000	-835.6360-	728.2724
	UROLOGY	257.27273	198.66720	.914	-487.2051-	1001.7506

*. The mean difference is significant at the 0.05 level.

