Parting Words

By Agnes Forster, Editor

This being my final issue, some parting words are offered before passing over the ownership of the *Canadian Operating Room Nursing Journal* to ORNAC and its future publisher.

After 19 years and 91 issues I am pleased to be retiring and happy to pursue other challenges, at a much leisurely pace. I am sad to leave the work I loved, and especially sorry to part company with the many great OR nurses who authored all the outstanding articles. My thanks to the guidance of the ORNAC Review Board members I've had the pleasure to know, and most especially, the eight outstanding ORNAC presidents with whom I worked so closely.

I share a sense of accomplishment with my husband Ron Forster in creating a small publishing business that launched five nursing-related journals and supported several talented editors and support staff, notably Frank Fagan, the OR Journal's first editor from 1983 to 1990. It was an exciting experience being involved in the launch of the national OR association and in assisting with the publicity of their developments, projects, positions and conferences over the years.

Many remarkable manuscripts passed through our hands and many editorial firsts were achieved. In 1984 the Journal was the first to describe "The Separation of Conjoined Twins", and many hospitals urgently sought copies of articles providing information on Laser Surgery, Latex Allergy and Latex Protocol, and Universal Precautions. *Microscopic Tuboplasty* was published in 1983 and many of the first descriptions of new Laparoscopic and Laser procedures were presented to OR nurses, authored by Canadian OR nurses in their own journal. These exciting records were not our achievements, but those of the individual nurses who wanted to share their knowledge and expertise with their nursing colleagues. We were simply the medium, they provided the important messages.

Perioperative nurses who excel in their clinical practice and those who freely give of their time, talents and energies to enhance their specialty are highly regarded by their colleagues. Unfortunately, the number of these committed nurses, these 'special warriors' is small, but their efforts over the years, such as the development of the ORNAC Standards, Research Grants, Education Bursaries, and Approval of Education Programs (to name only a few) are undertakings that benefit all ranks of OR nurses. One can only hope that more and more young perioperative nurses get involved in their local groups and provincial association and make their unique contribution.

Articles are in very short supply these days, undoubtedly due to the turbulence within hospitals and in our lives. Who has time to prepare a manuscript ? Who has the time or energy for professional activities ? Amazingly, many do. Without the extra effort and dedication of the few individuals who do actively participate in association work, there would be no ORNAC. Without the shining efforts of those who do write, the Journal could not exist and perioperative nursing would lose a valued communications tool that has the capacity to inform, educate and inspire.

I thank the many advertisers who used the Journal's pages to market their products throughout the years. Without them, the Journal could not exist. Johnson&Johnson Medical Products has been in every issue since 1983. Other regulars included Allegiance Healthcare, 3M Health Care, and Karl Storz Endoscopy.

To the Journal's 3,300 subscribers - thank you for your support. ORNAC and its new publishers will carry on in 2002 with renewed energy, youthful enthusiasm and ingenuity. I salute you all. It has been an honor and grand pleasure to know you and be your " first assistant".

Good Luck to the new publishers and continued success to ORNAC and all its members. ❐

Computerized O.R. Scheduling: Is It An Accurate Predictor of Surgical Time ?

By Margaret Sorge, RN, BScN, MSHCA, CPN(C)

Chapter I: The Problem Defined

The Surgical Suite at the Peter Lougheed Center of the Calgary General Hospital implemented a Surgical Suite information system (Surgiserver) in 1996. Automation of the scheduling and inventory control functions is a critical requirement to ensure that information is accurate and timely. The intent of the system was two fold. Firstly, to provide information to upper management that is consistent with other hospitals within the Calgary region and to assist in the strategic planning for surgical services within the region. Secondly, to provide the Surgical Suite management with the necessary information to effectively manage the resources for one of the largest cost centers within the hospital. The initial focus was to implement the scheduling component of the information system to more accurately predict the surgical time requirements for at least 15,000 surgical cases per year.

Scheduling of surgical cases before implementation of computerized scheduling was facilitated manually, with the physician providing his anticipated time requirements. Thus, surgeons were largely self directing their surgical scheduling with the occasional intervention by the Surgical Suite manager. The automated scheduling system averages the skin to skin time (when the surgeon makes the first cut until completion of skin closure) from the last ten identical procedures. The system then eliminates the highest and lowest skin to skin time and averages the times from the eight remaining cases. In addition, standard times have been given to the other components of surgery such as room set up, anaesthesia, preparation of the patient and the time from skin closure until the patient leaves the room. Although some clinical judgment is occasionally exercised, scheduling is primarily facilitated through the computer-generated times. Retrospective reviews appear to indicate that the computer-generated time is often accurate, however physician response continues to be doubtful of the systems' accuracy. This research will be conducted to determine if the computer-generated time is an accurate predictor of actual surgical time.

Abstract

The goal of this project was to determine whether a standardized surgical time, generated by the Operating Room Information System (ORIS), could be used as an accurate predictor of actual surgical time. Utilizing retrospective, quantitative data from the ORIS database, frequency distributions by surgical speciality, were completed. Chi-square analysis was applied to determine the significance of the frequency distributions. The study outcome indicates that ORIS computer generated procedure times were not an accurate predictor of actual surgical time. Further follow-up will be required to determine if alternate scheduling methodologies would lead to higher accuracy rates.

Author

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support services. Automation of scheduling allows the scheduler to use a historical average of the surgeon's times in addition to predetermined anesthesia, nursing and turnover times. The system also produces reports that can be utilized to monitor the accuracy of the anticipated times. However, as Wright et al. (1996) states, "scheduling software uses only historical data to make its estimates and does not take into account surgeon input or patient related factors" (p. 1236). Therefore, inaccuracies can occur and surgeon knowledge about the degree of complexity of the individual patient may have a major impact on operating time.

In a study done by Wright et al. (1996), surgeon predicted times were compared with the computerized time and they found that the accuracy of both was marginal. They concluded that a "model that combined the surgeon's estimate with historical data reduced the prediction errors significantly" (Wright et al., 1996, p. 1244). In an article by Dexter (1996), he reviews the study by Wright, et al. and says that the study should not be used as a determinant as to whether computer scheduling should or should not be used to schedule cases. This article questions the statistical methodology of Surgiserver (Omniserver) and discusses a study in which the accuracy and precision of the software's statistical method was examined. Dexter concludes that the system's mean times were a poorer predictor of actual time and that median time was a more accurate predictor, thus questioning the performance of the Surgiserver software.

Bross, Gamblin, Holtzclaw, and Johnston (1995) compared computer generated procedure lengths for singular procedures to actual procedure lengths. The data was grouped by surgical specialty and then by the surgical procedure lengths, based on the minutes they differed from estimated lengths. They concluded that computer generated times were accurate sixty five percent of the time and ultimately, beneficial to the Operating room.

Sier, Tobin, and McGurk (1997) introduce a mathematical model that incorporates constraint factors that affect scheduling. The model was evaluated by examining twenty of the most frequently performed operations at a hospital over the period of one month. They conclude, "while not necessarily providing the optimum solution, this technique seems to provide a reasonable procedure which will handle the requirements of hospitals" (Sier et al., 1997, p. 891). The drawback of this model is that hospitals would need to tailor a package appropriate for their needs and incorporate hospital specific constraint factors.

Regardless of the system or model used, the OR cannot function optimally if cases are not scheduled accurately. "Computerized information systems have helped by collecting data on operating times" (Patterson,1996, p. 22). "Relevant, timely, and accurate statistical data are essential and critical for nurse executives in problem solving, identifying trends, and, particularly, forecasting new assumptions and revisioned changes" (Mueller, Marinari, & Kunkel, 1995, p. 22). Although the need for OR data is documented well in the literature, there is inconsistency as to whether a scheduling system can accurately and consistently predict operating time requirements.

Chapter III: Methodology

Population/Sample

There were 7028 surgeries performed at the Peter Lougheed Center of the Calgary General Hospital between September 1, 1999 and February 28, 1999. Six surgical service categories were selected from the surgical services at the hospital. The rationale for the selection was the prominence of the program at the Peter Lougheed Hospital and the amount of cases performed by the service category (see Table 1). The service categories included General, Gynecology, Orthopedic, Peripheral vascular, ENT (ears, nose and throat) and Plastic surgery. Within each service category, ten surgical procedure categories were selected (convenience sampling), ensuring that the procedure ORIS standardized time varied, therefore including long and short procedures (Appendix A). Emergency procedures were not included because they were not booked in the ORIS system. The sample data was chosen from performed procedures and excluded multiple procedures.

Ten surgical cases from each procedure category were then randomly selected from an ORIS report, ensuring anonymity of the patients by covering the patient's names.

Data Collection Method

Descriptive research was done utilizing retrospective (historical), quantitative data from the ORIS database. An ORIS report generated the actual surgical time and the surgical schedule was used to determine the ORIS time given to the procedure. The data was entered onto a data collection form (Appendix B).

Table 1

Surgeries performed by service at the Peter Lougheed Center Between September 1, 1998 to February 28, 1999

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
General Surgery	241	279	258	248	269	255	1550
Orthopedic Surgery	315	326	337	296	350	365	1989
Plastic Surgery	120	71	114	74	94	88	561
Vascular Surgery	51	79	51	52	53	63	349
Gynecology Surgery	298	323	300	285	298	331	1835
ENT Surgery	75	95	97	57	102	78	504
							6788

Table 2

Frequency Distribution for General Surgery

Procedure	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
1	0	0	0	0	6	1	2	0	1	10
2	0	0	0	0	0	1	0	0	0	1
3	0	0	0	2	3	3	0	1	1	10
4	0	0	0	1	0	1	0	2	1	5
5	0	1	0	0	1	0	0	0	1	3
6	0	0	0	1	9	0	0	0	0	10
7	0	0	1	0	7	2	0	0	0	10
8	0	0	0	1	6	2	0	0	0	10
9	0	0	0	0	7	1	1	0	0	10
10	0	0	0	1	9	0	2	0	0	10
Total	**0**	**1**	**1**	**6**	**48**	**11**	**5**	**3**	**4**	**80**
%	0	1.27	1.27	7.60	60.76	13.92	6.33	3.80	5.06	100.06

Exact 48 Not Exact 32

Data Analysis Method

ORIS generated time (mean time) was compared with actual surgical procedure completion time. The data was manually grouped into procedure lengths, based on the number of minutes they differed from the ORIS computer generated time. An interval scale was used to group the data into fifteen-minute intervals, up to one hour (Appendix B). Procedures, which ended within fifteen minutes of their scheduled procedure length, were considered an accurate prediction. Frequency distributions were completed, first grouping the data by service category and then amalgamating the data to include all service categories. Chi-square analysis was used to determine the significance of the frequency distributions by comparing accurate procedure times generated by ORIS to the number of inaccurate procedure times.

The hypothesis of this study is that the ORIS generated time is an accurate predictor of actual surgical time. Procedures, which ended within fifteen minutes of their scheduled procedure length, were considered an accurate prediction.

The null hypothesis is that the ORIS generated time is not an accurate predictor of actual surgical time.

The study was discussed with the Administrative Leader of Surgical Services and the Medical Director of the Surgical Suite and both have given their support. Written permission was received from the Medical Director of the Surgical Suite. The data was collected over a period of six months beginning September 1, 1998 and ending February 28, 1999.

Chapter IV: Data Analysis

See Appendix C for a summary of the number of procedures actually collected by service and procedure code.

In the service category of General surgery, eighty surgeries were collected from the ORIS codes. Table 2 shows the number of cases collected for each code. Three codes did not meet the expected outcome of ten cases, therefore the sample was decreased by twenty.

Forty-eight surgeries were in the exact category, therefore thirty-two cases were booked inaccurately. This meant that 60.76% were booked accurately and

39.25% were inaccurately booked. 29.11% of the cases went overtime, while 10.11% were completed early. Chi square analysis shows that 1.6 is smaller than Critical Chi (3.841), therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

Table 3

Frequency Distribution for Orthopedic Surgery

Procedure	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
1	1	0	4	1	1	2	1	0	0	10
2	0	0	0	3	6	0	1	0	0	10
3	0	0	1	0	5	3	0	0	1	10
4	0	0	0	0	7	3	0	0	0	10
5	1	1	1	3	1	3	0	0	0	10
6	0	0	0	0	8	1	0	0	1	10
7	0	0	0	0	1	3	1	0	1	6
8	0	0	0	0	4	1	1	1	3	10
9	0	0	0	0	8	2	0	0	0	10
10	0	0	1	1	8	0	0	0	0	10
Total	**2**	**1**	**7**	**8**	**49**	**18**	**4**	**1**	**6**	**96**
%	2.08	1.04	7.29	8.33	51.04	18.75	4.17	1.04	6.25	99.99

Exact 49 Not Exact 47

Table 4

Frequency Distribution for Plastic Surgery

Procedure	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
1	0	0	0	2	5	3	0	0	0	10
2	0	0	0	0	2	4	2	0	2	10
3	0	0	1	0	1	1	2	1	2	8
4	0	0	1	0	1	1	0	0	1	4
5	0	0	0	1	3	0	1	1	0	6
6	0	0	0	0	9	1	0	0	0	10
7	0	0	0	1	0	0	0	0	2	3
8	0	0	0	3	5	2	0	0	0	10
9	0	0	0	0	0	0	0	0	0	0
10	0	1	1	1	1	1	1	0	0	6
Total	**0**	**1**	**3**	**8**	**27**	**13**	**6**	**2**	**7**	**67**
%	0	1.49	4.48	11.94	40.30	19.40	8.96	2.99	10.45	100.0

Exact 27 Not Exact 40

Table 3 shows that in Orthopedic surgery, ninety-six cases were collected with one code not meeting the expected outcome of ten cases.

Forty-nine surgeries were in the exact category, therefore forty-seven cases were booked inaccurately. This meant that 51.04% were booked accurately and 48.95% were booked inaccurately. 30.21% of the cases went overtime, while 18.74% were completed early. Chi square analysis shows that .021 is smaller than Critical Chi (3.841), therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

With Plastic Surgery, it is shown in Table 4 that sixty-seven cases were collected. Six cases did not meet the expected outcome of ten cases, including one code with no cases.

Twenty-seven cases were in the exact category, leaving forty cases with inaccurate booking time. 40.3% were booked accurately and 59.71% were inaccurately booked. 41.8% of the cases went overtime and 17.91% were completed early.Chi square analysis shows that 1.261 is smaller than Critical Chi (3.841), therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

Peripheral vascular surgery had fifty-two cases collected. Table 5 shows that two ORIS categories had no elective cases booked and four other codes did not meet the anticipated sample of ten. This service's sample was therefore reduced by approximately 50%.

Table 5

Frequency Distribution for Peripheral Vascular Surgery

Procedure	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
1	0	0	3	1	3	1	1	1	0	10
2	0	0	0	1	0	0	1	0	5	7
3	1	0	0	1	0	0	0	0	0	2
4	1	0	1	1	4	1	0	2	0	10
5	0	0	0	1	3	4	1	1	0	10
6	0	0	1	0	6	3	0	0	0	10
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	1	1
10	0	0	0	1	1	0	0	0	0	2
Total	**2**	**0**	**5**	**6**	**17**	**9**	**3**	**4**	**6**	**52**
%	3.85	0	9.62	11.54	32.69	17.31	5.77	7.69	11.54	100.0

Exact 17 Not Exact 35

Seventeen cases were in the exact category, leaving thirty-five cases in the inaccurate category. Therefore, 32.69% were booked accurately and 67.32% inaccurately booked. 42.31% of the cases were in the overtime category, while 25.01% were completed early. Chi square analysis shows 3.115 is smaller than Critical Chi (3.841), therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

In the service of gynecology, eighty surgeries were collected. As shown in Table 6, four ORIS categories did not meet the expected outcome of ten cases. This service's sample was therefore, reduced by twenty.

Fifty-five cases were in the exact category, while twenty five were inaccurate. 68.75% of the cases were accurately booked and 31.25% were inaccurately booked. 26.25% of the cases went overtime and 5% were completed early. Chi square analysis shows that 5.625 is larger than Critical Chi (3.841), therefore reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

In ENT surgery, sixty-three cases were collected. Table 7 shows that six procedure codes did not meet the expected sample, including one code that reflected zero cases.

Forty-two surgeries (66.7%) met the criteria for the exact category, leaving twenty-one cases (33.33%), which were inaccurately booked. 25.4% of the cases went overtime, while 7.93% were completed early.

Table 6

Frequency Distribution for Gynecology Surgery

Procedure	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
1	0	0	0	0	2	2	1	1	0	6
2	0	0	0	1	7	1	0	1	0	10
3	0	0	0	0	3	2	0	0	0	5
4	0	0	0	0	10	0	0	0	0	10
5	0	0	0	0	9	1	0	0	0	10
6	0	0	0	1	4	5	0	0	0	10
7	0	0	0	1	9	0	0	0	0	10
8	0	0	0	1	6	3	0	0	0	10
9	0	0	0	0	4	0	1	0	0	5
10	0	0	0	0	1	1	2	0	0	4
Total	**0**	**0**	**0**	**4**	**55**	**15**	**4**	**2**	**0**	**80**
%	0	0	0	5.00	68.75	18.75	5.00	2.50	0	100

Exact 55 Not Exact 25

Chi square analysis shows 3.5 is smaller than Critical Chi (3.841), therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

Lastly, Table 8 shows that all surgical specialties had a total sample of 437 (anticipated 600). 238 were in the exact category, leaving 199 cases, which were inaccurately booked. Therefore, 54.46% were accurately booked and 45.54%, inaccurately booked. 31.81% of the cases went overtime, while 13.73% were completed early. Chi square analysis shows 3.028 is smaller than Critical Chi (3.841), therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

Chapter V: Summary, Conclusions and Recommendations

Summary

The purpose of this study was to determine if the standardized surgical time generated by the Operating Room Information System is an accurate predictor of actual surgical time or whether more clinical judgement needs to be utilized in conjunction with the computer generated time.

Chapter I reviewed the history of surgical scheduling at the Peter Lougheed Center. Prior to the implementation of Surgiserver, scheduling was facilitated manually, with the physician predicting the surgical time required. With the implementation of ORIS, the computer primarily generated scheduling time by averaging the skin to skin time of specific procedures. Although retrospective reviews appeared to indicate that the computer time was fairly accurate, physician response continued to be doubtful of the system's accuracy. In most cases the physicians expressed that they were under utilizing their time.

In Chapter II, a review of the literature recognized the requirement for efficient use of the Surgical Suite and that "inaccurate scheduling can also have an economic impact on other aspects of hospital operation" (Wright et al., 1996, p. 1235). Similarly, Austin and Laufman (1987) reported that information systems can demonstrate measurable benefits, including improvements in efficiency and productivity of the operating room as well as other support services. However, Wright et al. (1996) identified that historical averages do not take surgeon input or patient factors into account, supporting the belief that surgeon knowledge about the degree of complexity can have a major impact on operating time. In a study done by Wright et al. (1996), the authors found only marginal accuracy between surgeon predicted times and computerized time, however a model that combined both, significantly reduced prediction errors. Conversely, Bross et al. (1995) wrote that computer generated times provided sixty five percent accuracy and concluded this was beneficial to the operating room. In Sier et al. (1997), the authors recommended the use of a more complex mathematical methodology , thus requiring a customized computer system. This literature review demonstrated that there was inconsistency as to whether a computer system can accurately and consistently predict operating time requirements.

Table 7

Frequency Distribution for ENT Surgery

Procedure	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
1	0	0	0	1	1	0	0	0	0	2
2	0	1	0	0	0	0	0	0	3	4
3	0	0	0	0	7	1	2	0	0	10
4	0	0	0	0	3	1	0	0	0	4
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	2	2	0	0	0	4
7	0	0	0	1	9	0	0	0	0	10
8	0	1	0	1	3	3	0	1	0	9
9	0	0	0	0	8	2	0	0	0	10
10	0	0	0	0	9	1	0	0	0	10
Total	**0**	**2**	**0**	**3**	**42**	**10**	**2**	**1**	**3**	**63**
%	0	3.17	0	4.76	66.7	15.87	3.18	1.59	4.76	100.03

Exact 42 Not Exact 21

Chapter III identified that ten elective ORIS procedure categories were selected from six service categories. Ten cases were randomly selected from the ORIS procedure category. An ORIS report generated the actual times and the computer-generated time was manually determined from the surgical schedule. The case times were then manually entered into frequency distributions for each service category and a final frequency distribution for all service categories. Cases ending within fifteen minutes of their scheduled procedure length being considered accurate. The null hypothesis was that the ORIS generated time is not an accurate predictor of actual surgical time. Chi square analysis was used to determine the significance of the frequency distributions by comparing the number of accurate surgical times to inaccurate times.

Table 8

Frequency Distribution for All Surgical Specialities

Service	< 60	< 45	< 30	< 15	Exact	> 15	> 30	> 45	> 60	Total
General	0	1	1	6	48	11	5	3	4	79
Orthopedics	2	1	7	8	49	18	4	1	6	96
Plastics	0	1	3	8	27	13	6	2	7	67
Vascular	2	0	5	6	17	9	3	4	6	52
Gynecology	0	0	0	4	55	15	4	2	0	80
ENT	0	2	0	3	42	10	2	1	3	63
Total	**4**	**5**	**16**	**35**	**238**	**76**	**24**	**13**	**26**	**437**
%	.92	1.14	3.66	8.01	54.46	17.39	5.49	2.98	5.95	100

Exact 238 Not Exact 199

Table 9

Comparison of Services by Percentage of Time the Cases are Booked Accurately,Overtime and Under Booked

Service	Accurate	Overtime	Under Booked
General	60.76	29.11	10.11
Orthopedics	51.04	30.21	18.74
Plastic	40.3	41.8	17.91
P. Vascular	32.69	42.31	25.01
Gynecology	68.75	26.25	5
ENT	66.7	25.4	7.93
All	**54.46**	**31.81**	**13.73**

The data analysis in Chapter IV, showed that the predicted sample was 600, however the actual sample for all surgeries was 437. The outcome of Chi square analysis in the service categories of General, Orthopedic, Plastic, Peripheral Vascular and ENT surgery, was do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time. However, in Gynecology surgery, the outcome of Chi square analysis was to reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time. Lastly, Chi square analysis of all surgical specialties was smaller than Critical Chi, therefore do not reject the null hypothesis that the ORIS time is not an accurate predictor of actual surgical time.

Conclusions

The data analysis indicates that with the exception of the gynecology service, the ORIS time did not accurately predict surgical times. This is contrary to the findings of Bross et al. (1995), who found that overall, the system achieved a sixty five percent accuracy rate. This study however, is consistent with Wright et al. (1996) and Dexter (1996), who concluded that computer averaging did not provide the required accuracy. Their conclusion was that alternate scheduling methodologies would lead to higher accuracy rates.

It is of interest that gynecology had a higher rate of accuracy than any other service and the least cases that were under booked. Further investigation would be required to determine if discrepancies between services exist. For instance, the system could be manipulated if surgeons booked inappropriately by booking a specific surgery to allow the least amount

of time but actually planning a more lengthy procedure. In addition, data discrepancies were identified while performing this research. Discrepancies could result from data entry error or judgement discrepancies in data entry. Broad procedure categories mean that data entry personnel sometimes need to make decisions as to where an unspecified procedure may fit. Broad procedure categories may also mean that more complicated procedures may have to be entered under a procedure code that is most similar. Further research would be required to determine procedural discrepancies and investigate whether other methodologies would provide an increased level of accuracy.

Table 9 shows each service and the percentage of accurate case bookings, the percentage of times cases were under booked and the percentage of times that cases went over the booked time. The figures are interesting because it is evident that cases were more likely to go overtime than to finish early. Therefore, physician's perceptions that they are under utilizing their time, are inaccurate and in fact, they are often over utilizing their block time. The over utilization is also supported in a Utilization Report that was developed to measure the utilization of surgeon's and service designated times and whether they are using the time adequately. The report actually differentiates between scheduled hours used and overtime hours used. Overtime hours increase staffing costs because in many situations the staff will need to be paid at the overtime rate.

This study determined that the historical averaged surgical time is not an accurate predictor of future surgical time. Although it did not identify that more clinical judgement would lead to more accuracy, it is a methodology that should be examined. This is supported in the literature by Wright et al. (1996), who found that a model that combined both the computerized time and surgeon predicted time, significantly reduced prediction errors.

With the exception of gynecology, the null hypothesis outcome was, do not reject that the ORIS time is not an accurate predictor of actual surgical time.

Recommendations

- Investigate the feasibility of incorporating more surgeon input into the booking process and then review the accuracy of the combined system.
- Develop data entry guidelines to improve the reliability of the post operative data entry.
- Examine the feasibility of expanding the in-house procedure coding system to reduce the combining of procedures with variable complexities and therefore, differing time requirements.
- Examine individual surgeon booking practices, including whether there is continuity between what the surgeon books and the actual procedure performed.
- Monitor and maintain the computer system data to ensure the integrity of the data.
- Further research is conducted, to ensure that surgical suite time is optimized and cost efficient.

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APPENDIX A

ORIS Surgical Cases List Including Service Category, Surgical Case Name and ORIS Procedure Code

General Surgery		Peripheral Vascular	
Mastectomy: Total Nodes	7BRMSND	Abdominal Aortic Aneurysm	7VSAAA
Total Colectomy	7BWCOLTL	Aorto Bifemoral Bypass	7VSBYAOB
Bowel: Hemicolectomy	7BWCOLHE	Femoral to Femoral Bypass	7VSBYFM
Bowel: Restorative Proctocolectomy	7BWPROR	Carotid Endarterectomy	7VSCTEND
Open Nissen Fundoplication	7HERNFDO	Varicose Veins- Bilateral	7VVSTCV
Breast Biopsy- Needle Localization	7BRBXNLU	Varicose Veins- Unilateral	7VSVVU
Laparoscopic Cholecystectomy	7CHOLL	Profundoplasty	7VSPRO
Hemorrhoidectomy	7HEMECT	Vascular Embolectomy- Femoral	7VSEMBF
Inguinal Hernia Repair (Unilateral)	7HERINOU	Aorto-Bifemoral	7VSBYABR
Rectal Sphincterotomy	7RCINTSP	Repair False Aneurysm	7VSFA

Orthopedic Surgery		Gynecology	
Hip: Total Revision	7HIPTLRV		
Replacement: Total Hip	7HPTRVSP	A & P Repair	7BLANPORO
Shoulder Repair- Anterior	7SHDRAN	Abdominal Hysterectomy	7HYSOSOB
Total Knee Arthroplasty- Biomet	7KNTBIO	Vaginal Hysterectomy: A & P Repair	7VAGAPRN
Knee ACL- Arthroscopic	7KNACLAS	Laser Cone Biopsy	7CNB
Knee Arthroscopy	7KNASCPY	Hysteroscopy, D & C	7HYSCOPY
Shoulder Acromioplasty	7SHDACP	Vaginal Hysterectomy	7HYSVG
Shoulder: Total Joint Replacement	7SHDTLRP	Laparoscopic Tubal Clipping	7LAPTC
Shoulder: Arthroscopy	7SHASCPY	Laparoscopy, D & C	7LAPDCC
Tendon Repair	7TNDRP	Bladder: Burch Repair	7BLBRCH
		Laparotomy- Myomectomy	7LAPMYOM

Plastic Surgery		ENT	
Breast Augmentation	7BRAUGB		
Breast Reduction	7BRRDB	Flap- Neck Reconstruction	7FPNKRCN
Face: Lift, Rhytidectomy	7FCRHYT	Tympanoplasty	7EARTYPL
Panniculectomy	7ABPANEC	Stapedectomy	7EARSTAP
Liposuction	7LIPOSI	Esophagoscopy	7ESOPENT
Nerve Repair	7NVAP	Bilateral Myringotomy and Tube	7EARMYTB
Rhinoplasty	7NSRHIPL	Laryngoscopy- Micro Suspension	7LRYSCMS
Skin- Z-plasty	7SKNZP	Submandibular Gland Excision	7NKSBGEX
SMR	7NSSMRP	Septoplasty	7NSSEPPL
Wound Closure	7WNDCL	Tonsillectomy	7TNECT

APPENDIX B

Frequency Distribution

Procedure	<60	<45	<30	<15	Exact	>15	>30	>45	>60	Total

APPENDIX C

Number of Cases Actually Collected by Surgical Procedure

Surgical Specialty	Surgery	ORIS Code	# of procedures actually collected
General Surgery	Mastectomy: Total nodes	7BRMSMD	10
	Total Colectomy	7BWCOLTL	1
	Bowel: Hemicolectomy	7BWCOLHE	10
	Bowel: Restorative Proctocolectomy	7BWPROR	5
	Open Nissen Fundoplication	7HERNFDU	3
	Breast Biopsy: Needle Localization	7BRBXNLU	10
	Laparoscopic Cholecystectomy	7CHOLL	10
	Hemorroidectomy	7HEMECT	10
	Inguinal Hernia Repair (Unilateral)	7HERNIUO	10
	Rectal Sphincterotomy	7RTINTSP	10
Orthopedic Surgery	Hip: Total Revision	7HIPTLRV	10
	Replacement: Total Hip	7HPTDEND	10
	Shoulder Repair: Anterior	7SHDRAN	10
	Total Knee Arthroplasty- Biomet	7KNTBIO	10
	Knee ACL - Arthroscopic	7KNACLRA	10
	Knee Arthroscopy	7KNASCU	10
	Shoulder Acromioplasty	7SHDACP	6
	Shoulder: Total Joint Replacement	7SHDTLRP	10
	Shoulder Arthroscopy	7SHASCPY	10
	Tendon Repair	7TNDRP	10
Plastic Surgery	Breast Augmentation	7BRAUGB	10
	Breast Reduction	7BRRDB	10
	Face: Lift, Rhytidectomy	7FCRHYT	8
	Panniculectomy	7ABPANEC	4
	Liposuction	7LIPOSI	6
	Nerve Repair	7NVAP	10
	Rhinoplasty	7NSRHIPL	3
	Skin- Z-plasty	7SKNZP	10
	SMR	7NSSMRP	0
	Wound Closure	7WNDCL	6
Peripheral Vascular	Abdominal Aortic Aneurysm	7VSAAA	10
	Aorto Bifemoral Bypass	7VSBYAOB	7
	Femoral to Femoral Bypass	7VSBYFM	2
	Carotid Endarterectomy	7VSCTEBD	10
	Varicose Veins- Bilateral	7VVSTCV	10
	Varicose Veins- Unilateral	7VSVVU	10
	Profundoplasty	7VSPRO	0
	Vascular Embolectomy- Femoral	7VSEMBF	0
	Aorto-Bifemoral	7VSBYABR	1
	Repair False Aneurysm	7VSFA	2
Gynecology	A & P Repair	7BLANPORO	6
	Abdominal Hysterectomy	7HYSOSOB	10
	Vaginal Hysterectomy: A & P Repair	7VAGAPRN	5
	Laser Cone Biopsy	7CNB	10
	Hysteroscopy: D & C	7HYSCOPY	10
	Vaginal Hysterectomy	7HYSVG	10
	Laparoscopic Tubal Clipping	7LAPTC	10
	Laparoscopy, D & C	7LAPDCC	10
	Bladder: Burch Repair	7BLBRCH	5
	Laparotomy- Myomectomy	7LAPMYOM	4
ENT	Flap- Neck Reconstruction	7FPNKRCN	2
	Laryngectomy	7LRYECT	4
	Tympanoplasty	7EARTYPL	10
	Stapedectomy	7EARSTAP	4
	Esophagoscopy	7ESOPENT	0
	Bilateral Myringotomy & Tube	7EARMYTB	4
	Laryngoscopy- Micro Suspension	7LRYSCMS	10
	Submandibular Gland Excision	7NKSBGEX	9
	Septoplasty	7NSSEPPL	10
	Tonsillectomy	7TNECT	10

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