

Appendicectomy Audit: A Review of Acute Appendicitis Cases at King Abdulaziz Hospital and Oncology Centre, Jeddah, Saudi Arabia

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ABSTRACT. Appendicectomy is one of the most common surgical procedures utilizing a significant amount of healthcare resources. Because of a high volume of the disease, it is important that strict protocol be designed and adhered to for diagnosis, operation, and management of the cases. This study was designed to review the existing "Discharge Planning Process", physician-specific "Diagnostic Accuracy Rate", and length of stay (LOS) for primary cases of acute appendicitis. Two hundred and thirty-four (234) cases, admitted during May 1 and September 30, 1996, were included in the study. Average LOS was found to be 3.94 days (median=3 and 4 days) with a physician-specific variation between 3.38-4.60 days ($t=9.11$, $P<0.001$). Diagnostic accuracy was found to be 92.7% with a physician-specific variation between 75.0% and 100%. Diagnostic accuracy for males was 92.7% while for females it was 79.7% ($\chi^2=8.35$, $P<0.001$).

Keywords: Audit, Acute appendicitis, Discharge planning, Diagnostic accuracy rate.

Introduction

Appendicectomy is one of the most common operations in most developed countries, especially in children and young adults^[1]. A change in the incidence of acute ap-

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pendicitis has implications on acute surgical bed usage, experience for trainee surgeons, and referral pattern for general practitioners^[2]. Because of the high volume of appendicitis cases, the disease utilizes a significant amount of health care resources. From administrative, quality, and financial perspectives, it is essential that strict protocols be designed and adhered to for the diagnosis, preoperative, intra-operative, and postoperative care of the patients. Admission of true positive cases only and elimination of unnecessary LOS can help in controlling costs associated with the management of the disease. An increase in the overall and physician-specific PSDA (PSDA) cannot only help in controlling costs, but can also help in decreasing long-term risks to the patients^[3]. Two hundred and thirty-four (234) cases with a primary diagnosis of acute appendicitis were admitted at the King Abdulaziz Hospital and Oncology Centre (KA-HOC), Jeddah from May 1 to September 30, 1996. These cases were studied to achieve the following objectives: a) To study the existing "Discharge Planning Process" of appendectomy cases, b) To identify the overall and physician-specific PSDA rates for typical cases of acute appendicitis, c) To suggest an appropriate "Discharge Planning Program" which is best suited for the patients, surgeons, and management.

Patients and Methods

All cases with a preoperative/admission diagnosis of acute appendicitis were included in the study. Cases with appendicular mass and unspecified abdominal pain were excluded from the study. Medical record number, age, sex, and nationality of the patients were collected as baseline statistics. Preoperative, postoperative, and total LOS were included in the study to explore the utilization pattern. Data about final diagnosis, surgeon's observation, and histopathology findings were also collected to calculate the proportion of positive appendectomies. Data sources included the face sheet, operation notes, and histopathology reports from the medical record of the patients.

Data were collected on a precoded data collection sheet by a medical record technician. "Surgeon's observations" were noted by a physician from the operation notes. Findings were entered in the computer by a data entry clerk and rechecked by another. Data and statistical analysis was done with the help of Epi-Info Ver. 6.

Results

The mean age of the patients included in the study was 23.2 years (SD=9.85) with a range of 3-58 years. Approximately three-fourth of the patients were between 10 and 29 years. Out of all cases, 69 (29.5%) were females while 165 (70.5%) were males giving a female:male ratio of 1:2.4. The mean age of the males was 24.9 years while the females had a mean age of 19.9 years. The difference, however, was not significant ($t=1.28$, $P=NS$). Only 85 (36.3%) of the total number of patients were Saudi. Other nationalities were Yemeni (20.1%), Egyptian (16.7%) and the rest of them belonged to other nationalities (63.2%), respectively.

Table 1 shows the distribution of total, preoperative and postoperative LOS for the patients with acute appendicitis. Two hundred and thirty-one (231) patients were operated upon within 24 hours of admission (most of them within 5-10 hours of admission). Only three cases were operated upon the second preoperative day. The mean postoperative LOS was 3.06 days (SD=2.68) and the median postoperative LOS was 2 days (93 cases) followed by 3 days (89 cases). The mean total LOS was 3.94 days (SD=2.68) while the median total LOS was 3 and 4 days (91 cases each).

TABLE 1. Total, preoperative, and postoperative LOS for the patients with acute appendicitis.

No. of Days	Length of Stay					
	Total		Preoperative		Postoperative	
	No.	%	No.	%	No.	%
1	-	-	231	98.7	6	2.6
2	6	2.6	3	1.3	93	39.7
3	91	38.9	----	----	89	38.0
4	91	38.9	-	-	23	9.8
5	22	9.4	-	-	10	4.3
6	11	4.7	-	-	7	3.0
7	7	3.0	-	-	3	1.3
8	3	1.3	-	-	1	0.4
9	1	0.4	-	-	-	-
10	-	-	-	-	1	0.4
11	1	0.4	-	-	-	-
39	-	-	-	-	1	0.4
40	1	0.4	-	-	-	-
Total	234	100	234	100	234	100

Table 2 shows the distribution of mean total LOS for consultants (responsible for admission/supervision of the cases) and mean total LOS for registrars/residents (responsible for operating the cases). Table 3 gives the comparison between "Final Diagnosis" as written on the face sheet, and "Surgeon's Observation" as written in the operation notes.

For acute appendicitis, the final diagnosis should be based on the findings of the operation, as mentioned in the operation notes. As evident from the above table, final diagnosis was not compatible with the surgeon's observation in 30 cases (12.8%).

Table 4 compares the histopathology findings from the histopathology report with the surgeon's observation as written in the operation notes. The most significant finding in Table 4 is the cases (n=22) found to have histopathological diagnosis of lymphoid follicular hyperplasia (normal appendix), while the physicians had labelled them as "acute appendicitis cases".

TABLE 2. Distribution of the mean LOS for various consultants and residents/registrars responsible for supervising and operating the cases.

Consultants/Residents/ Registrars	Patients/Supervised/ Operated	Mean LOS	95% CI
Resident H	10	4.60	3.67 - 5.53
Consultant E	24	4.30	3.85 - 4.75
Resident G	15	4.27	3.22 - 5.33
Registrar P	16	4.19	3.49 - 4.89
Consultant B	53	4.15	3.76 - 4.53
Registrar Q	14	4.14	3.60 - 4.68
Resident I	15	4.13	3.52 - 4.73
Resident L	16	4.06	3.64 - 4.48
Consultant C	43	3.95	3.52 - 4.38
Registrar N	19	3.84	3.37 - 4.36
Consultant D	56	3.79	3.47 - 4.11
Consultant A	56	3.73	3.46 - 4.00
Resident M	15	3.67	2.99 - 4.35
Registrar K	23	3.65	3.35 - 3.94
Resident J	16	3.38	2.98 - 3.77
Others	75	-	-
Total	466	3.94	3.78 - 4.10

TABLE 3. Comparison between the final diagnosis and surgeon's observation for the cases of acute appendicitis.

Surgeon's Observation*	Final Diagnosis*				Total
	Acute Appendicitis	Perforated Appendix	Appendicular Abscess	Gangrenous Appendix	
Acutely inflamed appendix	194	1	-	-	195
Perforated appendix	5	3	1	-	9
Appendicular abscess	4	2	5	-	11
Gangrenous appendix	9	2	-	-	13
Normal appendix	5	-	-	2	5
Condition not stated	1	-	-	-	1
Total	218	8	6	-	234

* Final diagnosis was taken from the face sheet while the surgeon's observation was taken from the operation notes.

TABLE 4. Comparison between the histopathology findings and the surgeon's observation for the cases of acute appendicitis.

Surgeon's Observation	Histopathology Findings							Total
	ASA	PA	CA	GA	LFH	OF	MR	
Acutely inflamed appendix	125	1	3	29	22	1	14	195
Perforated appendix	4	2	-	3	-	-	-	9
Appendicular abscess	6	2	-	2	-	-	1	11
Gangrenous appendix	5	-	1	7	-	-	-	13
Normal appendix	1	-	-	-	3	-	1	5
Condition not stated	-	-	-	-	1	-	-	1
Total	141	5	4	41	26	1	16	234

ASA: Acute suppurative appendicitis with focal peritonitis

PA: Perforated appendix

CA: Congested/catatarrhal appendix

GA: Gangrenous appendix

LFH: Lymphoid follicular hyperplasia (normal appendix)

OF: Other findings

MR: Missing report/specimen not sent to laboratory

TABLE 5. Distribution of the PSDA rate for different consultants/residents/registrars who admitted/operated the cases.

Consultants/ Residents/ Registrars	Patients Supervised/ Operated	Appendicitis Positive Cases	Diagnostic Accuracy Rate (%)	95% CI
Resident L	16	16	100	-
Resident H	10	10	100	-
Resident G	16	15	93.7	90.6 - 96.8
Registrar P	16	15	93.7	90.6 - 96.8
Consultant A	56	52	92.9	89.6 - 96.2
Registrar Q	14	13	92.9	89.6 - 96.2
Consultant D	56	51	91.1	87.5 - 94.8
All others	74	67	90.5	86.7 - 94.3
Consultant B	54	48	88.9	84.9 - 92.9
Consultant E	24	21	87.5	83.3 - 91.7
Resident I	15	13	86.7	82.4 - 91.1
Resident M	15	13	86.7	82.4 - 91.9
Registrar N	19	16	84.2	79.5 - 88.9
Consultant C	43	35	81.4	76.4 - 86.4
Registrar K	23	18	78.3	73.0 - 83.6
Resident J	16	12	75.0	69.5 - 80.6
Total	467	415	88.8	84.8 - 92.8

Table 5 gives the distribution of the PSDA rate for different consultants (responsible for admission/supervision of the cases) and for different registrars/residents (responsible for operating the cases). Only 2 physicians had a success rate of less than 80%. Incidentally, these 2 physicians had the minimum mean LOS as well as compared to the others.

Discussion

Indicators related to acute appendicitis such as PSDA, length of stay, etc., need to be monitored simply because it is one of the high volume diseases in any surgical unit. The study of acute appendicitis is helpful to standardize the procedure and decrease the disease-related variations. Gaps and deficiencies for physician specific variation can be easily identified and mechanisms can be developed to correct them.

In the present study the preoperative LOS was more than 24 hours for only three (1.3%) cases. Most of the cases were operated on between 5-10 hours of admission. This, however, does not include the waiting time in the Emergency Room.

For postoperative LOS, surprisingly six cases were discharged in less than 48 hours after the operation (postoperation LOS = 1 day). These cases were isolated and reviewed for the possibility of re-admission or to find a reason for an early discharge. These cases had postoperative LOS of 35, 36, 42, 44, 44, 46 hours, respectively. One patient "left against medical advice" after the operation while 5 others were discharged by doctors. Two of them had postoperative fever. Fortunately, none of them was re-admitted for postoperative complications. Early discharge of these cases indicates that a minimum postoperative LOS should be mentioned in the discharge planning protocol.

Postoperative LOS shows that 182 cases (77.8%) were discharged in 2-3 days after the operation. Twenty-three (23) cases had a postoperative LOS of more than 4 days, indicating the possibility of a special cause variation. These cases were studied to identify the reason for increased LOS. A combination of postoperative fever, wound infection, diarrhoea, and perforated appendix were noted in 14 cases. Constipation, high serum creatinine level, postoperatively diagnosed active tuberculosis, and faecocutaneous fistula were noted in 1 case each. No reason could be isolated in 5 cases from the medical record. Infected wound, diarrhoea, and fever increased the LOS by 2-4 days. Five consultants had mainly contributed to admitting and supervising 99.1% of the total cases. Only 15 cases were actually operated by the consultants who were responsible for all the admissions. Maximum average LOS for any consultant was 4.30 days, while minimum average LOS was 3.73 days. This difference was statistically significant ($t=13.84$, $P<0.001$).

A total of 37 surgeons (mostly residents and registrars) performed 234 appendicectomies. Ten of them performed more than 9 procedures. The maximum mean LOS for any resident/registrar was 4.60 days, while minimum mean LOS was 3.38 days. This difference was statistically significant ($t=9.11$, $P<0.001$). A comparison of

the final diagnosis with surgeon's observation revealed that 29 cases had different diagnosis on the face sheet when compared with surgeon's observations. The most common mistake was the loss of specificity of surgeon's observation (such as gangrenous, necrotic, perforated appendix) and writing a general final diagnosis as "acute appendicitis". Final diagnosis should have maximum similarity with surgeon's observation.

Registrars/residents did not review the operation notes before writing the final diagnosis. This can affect ICD coding as well. Twenty-six (26) cases labelled as acute appendicitis were found to have normal appendix on histopathological examination. This gives an overall PSDA rate of 88.9% (95% CI=84.8-92.8%). PSDA was found to be better for males than for females. Out of 69 females, 14 had a normal appendix while out of 165 males, only 12 had a normal appendix. PSDA was 79.7% in females and 92.7% in males. This difference was statistically significant ($\chi^2=8.35$, $P<0.01$). Wen and Naylor^[4] also found the PSDA in females to be less than males. The PSDA rate of 88.9% is quite satisfactory when compared with the results from some other studies. In a large study involving several institutions, the PSDA ranged from 50% to 96.7%^[4]. In another study, the rate of histologically proven negative appendicectomies in the retrospective series was 40% and in the prospective series, 33%^[5]. Some other studies mentioned the PSDA rate of 78%, 76%, and 81%, respectively^[6-8].

As the existing "DPP" is concerned, most of the cases were operated upon in 5-10 hours of admission and were discharged after 2-3 days of admission. It is not clear from the medical record whether the cases were examined by the consultants at the time of admission or before the operation. It is also not clear whether the consultants were present in the operating theatre during the operation or not. The PSDA may further increase if the DPP protocol includes that a surgeon must examine a case of acute appendicitis before the operation. This is especially important for females who have a significantly less PSDA rate than the males. Izbicki^[5] concluded that accurate diagnosis of appendicitis depends largely on the experience of the surgeon and is not improved by the application of a scoring system. Physical presence of the consultant to supervise the case may be argued because intra-operative complications could be identified only in 1 case (faecocutaneous fistula).

As the cases are typically discharged on the second or third postoperative day, the DPP protocol should include that no case be discharged before 48 hours after an operation. The Quality Management Department may consider the exploration of all such cases with a postoperative LOS of more than 4 cases to identify a possible cause of increased LOS such as postoperative wound infection or fever. The present study reveals that the residents and registrars need to be trained to write the exact final diagnosis based on intra-operative diagnosis. The quality of documentation was also found to be variable in several numbers of operation notes.

Preoperative examination of all cases of acute appendicitis by an experienced consultant, review of all the cases with postoperative LOS of more than 4 days, and review

in decreasing the cost associated with the disease.

In conclusion, a review of 234 cases with the primary diagnosis of acute appendicitis at KAHOC, Jeddah showed a mean LOS of 4.07 days. Physician-specific LOS varied between 3.31 to 4.60 days. An overall PSDA rate was 88.8% with the physician-specific variation between 75% and 100%. The PSDA was found to be significantly less for females (79.7%) than for males (92.7%) ($P < 0.01$), respectively. Wound infection, diarrhoea, and fever were the most frequent postoperative complications, increasing the LOS by 3-4 days. Residents/registrar need to be educated in writing a detailed and specific discharge diagnosis and in filling out the operation notes properly. The Department of General Surgery needs to develop a "Discharge Planning Protocol" based on the findings of the study to further increase the diagnostic accuracy rate, decrease unnecessary appendicectomies (especially in females), and decrease unnecessary LOS, thus helping the management to achieve the aim of cost containment.

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تدقيق تقويمي في مستوى الانجاز الطبي في حالات استئصال الزائدة الدودية: مراجعة حالات التهاب الزائدة الدودية الحاد في مستشفى الملك عبدالعزيز ومركز الأورام بجدة

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المستخلص. تعتبر عملية استئصال الزائدة الدودية إحدى أكثر العمليات الجراحية حدوثاً وهي تستخدم حيزاً كبيراً في مجال الخدمات الصحية. ونظراً لوجود عدد كبير من الحالات كان لابد من إيجاد خطة مرتبة تتناول التشخيص والعمل الجراحي والتدبير الطبي للحالات. لقد قصدنا في هذه الدراسة أن ننظر في تخطيط الخروج للمريض وفي الدقة التشخيصية وهي مرتبطة بكل جراح بشكل نوعي وفي مدة الإقامة في المستشفى وذلك بالنسبة لحالات التهاب الزائدة الدودية الحاد. لقد جرى قبول ٢٢٤ حالة بين ١٩٩٦/٥/٨ و ١٩٩٦/٩/٣٠ وهي تشكل مادة الدراسة. وقد تبين أن مدة الإقامة الوسيطة كانت ٣.٩٤ يوماً (المتوسط ٣ إلى ٤ أيام) مع اختلاف نوعي بين الأطباء هو ٣.٢٨ إلى ٤.٦٠ يوماً. وكانت الدقة التشخيصية تساوي ٩٢.٧٪ مع وجود اختلاف نوعي بين الأطباء بين ٧٥٪ و ١٠٠٪. وقد تبين وجود اختلاف في الدقة التشخيصية بين الذكور (٩٢.٧٪) والإناث (٧٩.٧٪) تبعاً.