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Continuous Quality Assessment; Development of a Simple Computer Based Model for Audit

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Abstract

Objective: Accurate assessment of quality of care is a fundamental first step in the process of quality improvement. The vast amount of data generated in a hospital mandates some form of computerization for management of information. We describe a locally developed simple computer based program to access relevant information from a hospital patient management network. The objective was to reduce the amount of manual work involved for busy clinicians attempting to audit quality of care.

Methods: A single surgical procedure, Laparoscopic Cholecystectomy was chosen. Quality indicators were identified by literature review as conversion rate from laparoscopic to open cholecystectomy and length of hospital stay (LOS). A simple query was developed to extract the required information from hospital database. Commercially available spreadsheet software (Microsoft Excel) was used to calculate the rates. Outliers were defined as LOS more than 1 standard deviation from the mean. The second part of the study involved a manual review of case notes to validate the program and determine the causes for deviation from the mean.

Results: The program was able to access and process data as planned. In a one-year period from March 1997 to February 1998, two hundred and thirty one laparoscopic cholecystectomies were attempted. Twenty-three were converted to open procedures given a conversion rate of 9.96%. On manual review of case notes no false positives or false negatives were found. The reasons for conversion were similar to those described in the literature. The mean length of stay for laparoscopic cholecystectomy was 3.39 days and 7.17 days for converted cases. The commonest reason for delay in discharge was noted to be non-availability of elective operating time.

Conclusion: We have successfully developed and used a simple computer based program to access information stored in hospital patient management systems. Quality of care indicators identified from literature were used as standards. Outliers with respect to these were reviewed in detail to identify causes for deviation. The program was validated by manual review (JPMA 51 :317,2001).

Introduction

Recognition of need for minimal acceptable standards of medical care has been an important landmark in medical progress. Just as fundamental is the concept of continuous improvement in the quality of care. One of the best-established approaches to this goal is the practice of medical audit. For different areas of clinical practice, indicators of quality have and are being defined, these can be used as standard parameters for comparisons between institutions.

The Aga Khan University Hospital (AKUH) in the long run intends to have a fully computerized patient record system. Due to resource constraints and evolving technology, the process has been slow and stepwise. At present a variety of patient information is scattered over the developing network, making access particularly user-unfriendly. This study was undertaken to develop a user-friendly computerized program to monitor the quality of care for a given clinical situation using available information. The system is to perform as a screening tool to identify patients with unacceptable quality indicators thus narrowing and focusing the field of review for busy clinicians intending to address quality of care issues.

Laparoscopic cholecystectomy which accounts for 15% of all elective general surgery cases at AKUH-1

was the procedure identified to be audited, utilizing electronically available data.

Materials and Methods

The study was conducted in two parts. The initial part was the development of a computer program to extract required patient information from the hospital central data base. The second part involved a manual review of the case notes to validate the program and focus attention on problem cases. The hospital uses the MAGIC medical information database. The inpatient medical care episodes are computerized following conversion to International classification of diseases version 9 (ICD-9) coding system.

A program was developed to access this database and extract data on laparoscopic cholecystectomies. The data was next transferred to a windows based spread sheet (Microsoft Excel) where calculations to determine rates were performed.

The study population was all patients having a laparoscopic cholecystectomy attempted at AKUH March 1997 to February 1998. Indicators were defined as variables that are monitored over time to reflect the frequency or incidence of events under study. We identified two standard indicators for laparoscopic cholecystectomy based on literature review. These were:

1. Length of stay Date of discharge - date of admission.

The mean and median duration of stay is calculated and the number of outliers beyond one standard deviation identified by their medical records for further review.

2. Conversion rate from laparoscopic to open cholecystomies Our program calculates the indicators based on the following formulae:

Conversion rate = $\frac{\text{No. of laparoscopic cholecystectomies converted to open cholecystectomies}}{\text{Laparoscopic and converted cholecystectomies}} \times 100$

Validation:

In the second part of the study, the program was run on data related to inpatient admissions between 1st March 1997 and 28th February 1998.

Reviewing the case records of all converted laparoscopic cholecystectomies. identified false positives. These were defined as cases that were coded as converted cholecystectomies but had in fact either (a) completed laparoscopically and thus had not been converted or been (b) planned open procedures. A high false positive rate decreases the specificity of a screening test¹. We also reviewed ten percent (21 of 208) case charts. randomly selected. of laparoscopic cholecystectomies to ascertain the false negative rate. False negatives were defined as cases that were coded as laparoscopic cholecystectomies. but were actually either (a) converted or (b) planned open cholecystectomies. A high false negative rate decreases the sensitivity of a screening test.

Identification of outliers:

Outliers were defined as patients with duration of hospital stay beyond 1 standard deviation of the mean. While calculating outliers, cases with complicating diagnoses (e.g. malignancy, stone-induced pancreatitis). which would cause prolonged stay unrelated to the laparoscopic procedure. were excluded. The case charts of outliers in the duration of stay were reviewed and causes of prolonged stay identified.

Results

The program was able to access and process data as planned. Between 1st of March 1997 and 28th of February 1998, a total of 231 laparoscopic cholecystectomies were attempted. Two hundred and eight were successfully completed, 23 were converted to open procedure. The conversion rate calculated by the program was 9.96%. On review of files, no false positives or false negatives were found, giving a

sensitivity and specificity rate approximating 100%.

The reasons for conversion of 23 cases from laparoscopic to open procedures are listed (Table 1).

Table 1. Causes of Conversion*(n=23).

Causes of Conversion	Frequency
Adhesions/inflammation	16
Dissection difficulty	6
Visualization difficulty	6
Aberrant anatomy	2
Suspected bile duct injury	1
Suspected bile duct stone	1
Stone spillage	1

*The above categories are not mutually exclusive of each other.

The mean hospital stay for laparoscopic cholecystectomy was 3.39 days (reduced to 2.97 days, if cases with complicating diagnoses like pancreatitis were excluded, this group was labeled as adjusted') and 7.17 days for open cholecystectomy (Table 2).

Table 2. Duration of stay (n=230).

	Unconverted Laparoscopic Cholecystectomy	Unconverted Laparoscopic Cholecystectomy (adjusted)*	Converted Cholecystectomy
Number of Patients	208	193	23
Mean	3.39	2.97	7.17
Median	3	3	6
Standard Deviation	2.47	1.81	5.28

* Adjusted laparoscopic cholecystectomies were unconverted laparoscopic cholecystectomies excluding cases with complicating diagnoses (e.g. malignancy, stone-induced pancreatitis).

There were 20 outliers with respect to duration of stay in the adjusted laparoscopic group. The causes for prolonged stay in this group are summarized in Table 3.

Table 3. Causes of Prolonged stay in adjusted* Laparoscopic Cholecystectomies (n=20).

Cause**	Frequency
Pre-operative	
Conservative management/delay in scheduling	6
Delay secondary to other procedures	3
Suspected neoplasia	1
Post-operative	
Iatrogenic injury	3
Post-operative fever	3
Cardiac problems	3
Epigastric pain	2
Incomplete notes	2

* Adjusted laparoscopic cholecystectomies (Table 2),

** Causes not mutually exclusive of each other

Discussion

This study reports the development of a computer-based system for the quality assessment of laparoscopic cholecystectomies, by looking at 2 pre-defined indicators. These are calculated from information already available in the hospital patient information database. The use of systems and information already accessible is of considerable importance to health care facilities, especially in the developing world where the desire to assess quality as the step towards improvement, is often curbed by the constraints of time and finances.

Indicators in this study were chosen after a literature review²⁻⁵. Our current conversion rate was calculated at 9.96%. The conversion rates quoted in literature vary from 3.6 to 33%^{2,3} with most centers reporting rates between 4-15% depending upon the total percentage of procedures done laparoscopically, surgeon expertise and pre-operative diagnosis²⁻⁷. Causes of conversion to an open procedure in this series show a similar spectrum to those quoted in international literature, viz difficult dissection secondary to inflammation and adhesions, and retraction difficulty^{4,8}.

The mean and median length of stay (3.39 and 3 days respectively), were comparable but slightly longer, to those in international literature (2.72 and 36 days respectively). The program's ability to identify problem areas was demonstrated by focusing on patients staying beyond 1 standard deviation of mean. The case notes of these patients were reviewed in detail: this approach reduced the amount of work and allowed a more thorough examination. In this case the most common cause for prolonged stay was noted to be non-availability of elective operating time.

Due to time constraints, this study was limited to only two selected indicators. However, the program has the potential to be expanded to include more indicators as well to be applied to a greater variety of

surgeries. With the expansion of computerization in hospitals in the developing world, it is hoped that such programs will make meaningful research too for quality control a reality in these places where it is most needed.

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