Improvement of surgery department performance after implementing hospital quality standards' policies: two decades experience

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Background
Theodor Bilharz Research Institute (TBRI) Hospital comprises clinical departments, research laboratories, and different supporting services. General Surgery Department (GSD) in TBRI hospital has over 30 years of cumulative surgical and research experience. New managerial policy and quality procedures were developed and implemented from 2007 onwards in GSD.
The aim of this study was to assess the pattern of change in utilization and performance in GSD in TBRI hospital after implementing the new policies and procedures, from 2007 onwards.
Methods
This was a retrospective observational study. Electronic data were collected from the medical record unit and annual reports of TBRI hospital from the year 2001 to the year 2016. Hospital utilization indices, admission, surgical operations performed, bed utilization indices, average length of stay (ALOS), bed occupancy rate (BOR), bed turnover rate (BTR), and mortality rate (MR) were calculated before and after implementing the new policies and procedures from the year 2007 onwards.
Results
The shift to more skilled and major surgical operations was doubled, and the increase of elective surgeries increased to more than three-folds of emergency operations. There was marked increase of outpatient flow to more than three-folds, and decreased MR. The indicators used to show increase of performance in GSD were as follows: improvement in hospital bed indices decreased ALOS, increased BOR, and increased BTR. The year 2016 showed the optimization of all hospital indices: ALOS 5.5, BOR 74.2, BTR 48.9, and MR 0.1.
Conclusion
Quality improvement may not appear in the initial years of a program. It is recommended to keep up the implemented hospital quality policies and procedures to continue future improvement for better quality of patient care in GSD at TBRI hospital.

Keywords:
elective surgery, hospital bed indices, mortality rate, out-patient attendance, performance quality improvement

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Introduction

Theodor Bilharz Research Institute (TBRI) Hospital comprises clinical departments, research laboratories and different supporting services. General Surgery Department (GSD) (40 beds), is one of the clinical departments of TBRI hospital offering medical care, research and training activities in general and more specifically in the hepatopancreaticobiliary surgery field. In addition, the GSD includes the experimental surgical laboratory (for animals), that is, the corner stone for surgical research both on a local and national level. The medical record unit is one of the main support services related to the hospital. It is responsible for developing, designing, and managing automated medical records for 20 years [1].

Electronic medical records are the basis for statistics on performance related to inpatient activities, including number of beds, admissions, discharges, deaths and duration of stay. Outpatient records are the basis for utilization data [2]. Data derived from electronic medical records are a rich source of information and are used as an objective measure of the efficiency of the hospital management system [3,4]. Trend analysis of performance and hospital bed utilization is an

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important tool in measuring and formulating future strategies for hospital planning [5].

Performance in hospitals requires the use of a quantitative method and qualitative tools to identify high performance factors, such as positive organizational culture, senior management support, effective monitoring, building a proficient workforce, effective leaders, expertise-driven practice, and interdisciplinary teamwork [6]. Performance is the achievement of desired goals. Assessment is the process through which the needs are evaluated, to form the basis of the action plan [7].

GSD in TBRI hospital has over 30 years of cumulative surgical and research experience; it has been developed to be a center in HPB surgery, including transplantation. Managerial policy and quality procedures were developed and implemented as of 2007 onwards consecutively with new management. The implementation of the new strategy with a clearly articulated vision and mission has resulted in the development of highly technical surgical procedures in liver surgeries. This policy promotes three pillars: commitment, evidence-based medical practice and building surgical skills. Procedures were developed to enhance implementing the policy. Senior staff supervision was implemented in the outpatient clinic, inpatient wards, emergency and operating rooms. Participation of GSD in the TBRI quality assurance program under ISO 9001-2008 [8] required managerial and quality issues and the presence of a system with an auditing team. In addition, it also required the implementation of infection control guidelines [9] and the introduction of anesthesia outpatient clinic for screening of cases before surgeries. Moreover, it also required increased number of operating theaters with highly qualified appliances of anesthesia and new techniques in advanced surgeries. The implementation of WHO surgical patient safety checklist in 2009 has minimized surgical operation complications [10].

In GSD at TBRI hospital, standards of care were followed according to Egyptian Hospital Accreditation Standards, 2005 [11]. This involved performing investigations for patients at the outpatient clinic level then admitting them 24 h before the weekly scientific meeting of the surgical staff at which all elective and emergency operative lists of the week before and the week after were presented and discussed thoroughly to permit discussion and decision on evidence-based rules. GSD follows the standards of care in patient plan for discharge and follow-up of minor and moderate surgeries at 1–3 and 5–10 days for major and skilled surgeries. The implementation of evidence-based surgical (EBS) and best practice improved the surgical decision-making to treat our patients. The monthly morbidity and mortality audit meetings to monitor and evaluate reviewing the quality of services and performing regular audits to make and take corrective actions of any errors were also conducted. Evidence-based practice is a fundamental component of the surgical profession [12]. To enhance best practice, opinion leaders in surgical practice were found to be more educationally influential in research transfer than passive methods of lectures and conferences [13].

The aim of this study was to assess the pattern of change in utilization and performance in GSD in TBRI hospital after implementing the new policies and procedures from 2007 onwards.

Methods

This was a retrospective observational study. Data were collected from the electronic database available at the medical record unit of TBRI hospital, using software program Epi-Info (version 6.04; CDC, Atlanta, Georgia, USA). Annual hospital reports generated from these databases are used from the year 2001 to the year 2016. Electronic database records used to build on the reports were outpatient records, admission records, automated summary discharge records, surgical operative records, and mortality records. The annual reports include hospital utilization indices, admission rates, surgical type of operations performed, and mortality rate (MR). Internationally defined bed utilization indices, average length of stay (ALOS), bed occupancy rate (BOR), bed turnover rate (BTR), and MR were calculated as in a previous study [5], according to the number of available beds every year from the year 2001 to the year 2016.

Surgical operations were classified according to the Egyptian Ministry of Health into advanced, with special skills, with skills, major, moderate, minor and simple. In this study, to simplify analysis, all groups were gathered and presented within three categories: major operations including advanced, with special skills, with skills, and major operations; minor operations including minor and simple operations; Moderate operations include moderate group.

Complete data were collected from the surgical department audit from the year 2007 to the year 2012. These data included both elective and emergency operations performed. The data obtained

from the audit for the years 2001–2006 and for the years 2013–2016 were incomplete.

Brain storming sessions were conducted with the managerial surgical staff discussing the reasons behind the changes that occurred after implementing the new policies and procedures from 2007 onwards.

Ethical considerations

Confidentiality of data in medical records was maintained in this study. Data were available to the researcher without identification of patients. Approval was exempted for the used data with no interference to patients and their confidentiality.

Results

Table 1 shows the utilization pattern of different services related to the GSD. The outpatient clinic attendance and number of patients increased abruptly at the year 2008 with a steady increase in the year 2016 of more than three-folds (except in 2013). Emergency room attendance decreased during 2011–2013. Pattern of change in inpatient and total surgeries was more or less steady over the years, except during 2012–2013, when they increased.

Table 2 shows the different bed utilization indices and MR for GSD. ALOS increased from 14.9 in 2001 to reach a maximum in 2007 of 18.2, then steadily decreased over the years to become 5.5 in 2016. For the year 2006, the BOR and BTR were much less than other years. The BOR fluctuated from 2001 to reach the maximum of 97.8 in 2007, then decreased in 2010 until it became 40, then increased steadily to become 74.2 in 2016. BTR fluctuated from 20.4 in 2007 to reach 48.9 in 2016. MR showed a decreased trend to become 0.1 in 2016. Hence, the year 2016 showed the optimization of all hospital indices: ALOS 5.5, BOR 74.2, BTR 48.9, and MR 0.1.

Figure 1 shows that minor and moderate surgeries showed a decreasing trend. In contrast, major surgical operations showed a rising trend over the studied years, especially from the year 2007 onwards; it almost doubled in 2016. Moderate operations are more or less the same over the years, ranging from 200 to 300 operations per year and decreased to below 100 from 2014 to 2016. In the same time, the number of minor and simple operations declined over the years,

Table 1 Utilization pattern of patients at different service points (2001–2016)

Years	Outpatient clinic	Emergency room admission[a]	Total inpatient	Total surgeries
2001	856		981	731
2002	802		1062	825
2003	930		1408	914
2004	883	267	1507	877
2005	695	141	1015	686
2006	682	187	1035	671
2007	541	336	1274	842
2008	1163	356	1162	952
2009	1274	313	1473	911
2010	2375	313	1503	924
2011	2645	163	1174	865
2012	3144	122	1342	1032
2013	1410	130	1323	1021
2014	2921		1111	776
2015	3626		939	785
2016	3701		985	828

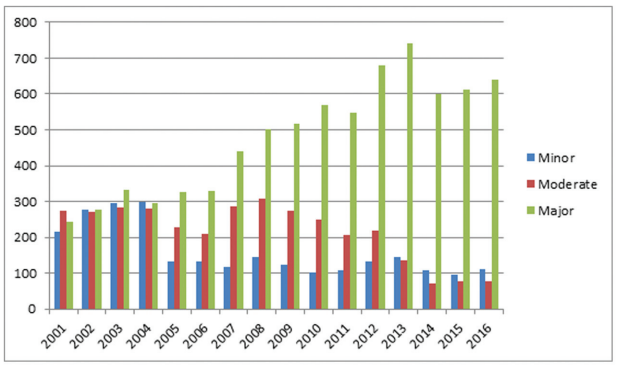
[a]This represents cases admitted to the inpatient section from emergency attendance for the years 2004–2013, the data missing were corrupted.

Table 2 Bed utilization indices and mortality rate for General Surgery Department (2001–2016)

	Bed utilization indices			
Years	LOS	BOR	BTR	Mortality rate
2001	14.9	77.7	19.2	0.5
2002	16.0	97.5	22.2	2.6
2003	18.1	91.6	20.9	0.7
2004	17.7	96.9	24.4	0.8
2005	18.0	83.8	16.9	1.1
2006	15.2	22.5	5.4	2.1
2007	18.2	97.8	20.4	0.4
2008	16.6	83.4	18.4	0.6
2009	15.0	68.7	16.7	0.8
2010	8.1	40.0	18.1	0.9
2011	11.8	57.6	17.9	1.1
2012	10.2	69.6	24.9	1.2
2013	9.5	69.9	26.8	0.4
2014	13.0	69.2	19.4	0.1
2015	7.9	45.1	31.0	0.2
2016	5.5	74.2	48.9	0.1

BOR, bed occupancy rate; BTR, bed turnover rate; LOS, average length of hospital stay.

Figure 1



Pattern of surgical operations at General Surgery Department (2001–2016).

from about 300 in the years 2003 and 2004, to become only around 100 operations per year in recent years.

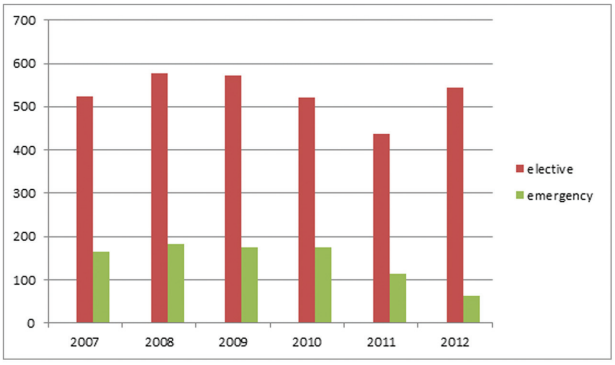
Figure 2 shows that elective operations increased from 2007 to 2009, and they comprised more than three-folds of emergency operations. Meanwhile, the emergency operation numbers are more or less the same from 2007 to 2010, with an obvious decrease after that in the years 2011 and 2012. There was a decrease in the peak of elective operations in the years 2010 and 2011 with another rise in 2012; at this year, elective surgeries were increasing at the expense of emergency surgeries by about nine-folds.

Discussion

The aim of this study was to make use of hospital utilization indices, developed by the medical record unit in TBRI hospital, trying to explain the rising performance of GSD in TBRI hospital, after managerial commitment to implement EBS practice, and procedures for raising surgical skills. This study tried to point the effect of different managerial polices and cumulative surgical experience on surgical service utilization of GSD, TBRI. Trend analysis of utilization data and bed indices over 16 years were used as tools for evaluation in this study.

Implementation of quality assurance program requires management commitment. Sustainable improvement to achieve stated goals and objectives requires cooperation between both staff and management. The implementation of hospital standards achieved within GSD in TBRI hospital in this study, such as the morbidity and mortality management committee that met monthly, keeping track of all electronic data records and official written records from meetings, for monitoring, control and evaluation, for example, supervisory checklists, mortality reviews, audited medical records, documented quality improvement programs, was carried out [14].

Figure 2



Type of Operations Conducted According to Audit of General Surgery Department from 2007 to 2012 (Emergency or Elective).

Applying different methods of performance evaluation together is highly recommended to reach a complete view of the real status of the hospital for future planning [15]. Performance indicators in GSD in TBRI hospital in this study are sorted into categories: inpatient utilization as BOR, ALOS, BTR, outpatient utilization, operating room utilization, ER utilization, patient safety, infection control and MR, which are used in performance to show trends and explain how improvements are being made over time [16–18].

In this study, although the number of patients in the outpatient clinic increased from 2008 onwards, the pattern of change in the inpatient unit and operations was fluctuating over years, but centered on near range. This finding was observed in another study carried out in another department of the same hospital [19]. The abrupt increase in outpatient attendance may have been caused by running the clinic by committed senior staff (certified general surgery specialist level) from 2007 onwards, with more refined selection and better management of cases. Senior staff supervision (certified general surgery consultant level) on outpatient clinic, inpatient wards, and operating rooms may be the reason for proper surgical decision-making, better on-job training for juniors, with commitment, and better patient care quality. In addition, that would reflect a good reputation of the clinic services and increased utilization from the target population, which was achieved. This refined selection of appropriate surgical cases may lead to an unchangeable number of utilization of inpatient section resources and operations carried out. Better performance upon introduction of senior staff in the outpatient clinic is comparable with the simulation model utilized before [20].

In this study, there was much improvement in the bed utilization indices observed after a prolonged time; 10 years from changes in the policies and procedures done in 2007 at GSD at TBRI hospital, BOR becomes within optimum range 74.2 in 2016. ALOS decreased to become 5.5 in 2016, and BTR reached a maximum increase over the years to become 48.9 in 2016. It is better to evaluate the three indices together to obtain meaningful analysis. Similar results were found in another department of the same hospital [19]. Moreover, there was much improvement from the last decade, as mentioned in a previous study in the

same hospital [5]. In the years 2006 and 2010, BOR and BTR were the least, which may be due to some maintenance work in the inpatient wards, and operating theater rooms.

In our study, similar to the other study, the impact of quality improvement strategies was noticed in avoidable admissions, and declines in postoperative complications. Laparoscopic surgeries result in short hospital stays [21]. With improvement of medical technology, some conditions previously treated for prolonged hospital stay, have been moved to 1-day hospitalization, with increased rate of operations carried out with special skills; thus, future research will be needed for medical innovation in research and development [5,22].

Other studies reported at a university hospital in Saudi Arabia that ALOS ranged from 7.9 to 9.4 and BOR was 57.7–75.6 in the GSD [23]. Another study carried out on six general hospitals, in the surgical sections, in Kuwait, found that ALOS ranged from 3.6 to 5.9 and BOR ranged from 50 to 70 [24]. In another teaching hospital in Iran, it was found that there was a relative improvement in all utilization measures in 2012, wherein ALOS was 4.3, BOR 70.9, BTR 60.8. Moreover, the hospital had an optimal level of performance, in terms of high BOR and high BTR that achieved the target value according to the national standards [25].

In our study, elective operations increased from 2007 to 2009, which indicate objective achievement. There was a decrease in the peak of elective operations in the years 2010 and 2011, then another rise in 2012, may be because of the construction of the new state of art operating theater rooms in the hospital, with highly advanced appliances for surgery and anaesthsia, and the increased number of the highly trained and qualified staff. In elective admissions, preoperative screening and planning for diagnostic tests and interventions could be often carried out in advance to avoid unnecessary preoperative days in the hospital. Decreasing ALOS may also be due to strict sterilization of all utensils and materials used for wound care [9] and patient preoperative anesthesia assessment in outpatient level, excluding invalid cases for surgery. However, length of stay must be reduced by measures that guarantee the same, or better, quality of care [26].

In this study, emergency operations showed a decreased trend over time, as it is not the main concern of the department, but it is a national duty to take emergency cases in the department, which matched with the policy of the institute. After 2011, it decreased to below 100 cases, because of partial closure of the emergency unit for long periods for security and safety reasons, except for some cases. Emergency operations face challenges, as there is limited opportunity for preoperative optimization of comorbidities and the need to coordinate healthcare providers and resources during nonpeak hours. Despite the burden, risk and complexity of care associated with emergency general surgery procedures, surgical quality improvement efforts have often focused on elective general surgery outcomes. Emergency general surgery are at great risk for adverse events than Elective general surgery [27]. In addition, performing elective surgery, allowed the hospital to establish a daily huddle, to check and avoid problems, that lead to complications, and increased length of stay [28].

In this study, there have been fluctuations in the MRs, as reported in Table 2, showing peaks of increased MRs in 2002, 2005 and 2006, then 2011 and 2012. MR decreased to become 0.1 in 2016, which may be due to implementation of operating room safety measures, infection control measures, and ISO application measures. The policy insisted on implementing guidelines of infection control, particularly antibiotic policy [9]. There are isolation beds for patients with infection, which is discussed at the monthly meetings of the morbidity and mortality committee, and within staff scientific weekly rounds, to take corrective and preventive actions. Moreover, implementations of WHO surgical patient safety checklist were carried out to minimize surgical operation complications [10]. This includes improving anaesthesia safety practice, ensuring correct site surgery, and avoiding surgical site infection [29].

In this study, involvement of GSD in TBRI hospital into quality assurance program ISO 9001-2008 standards [8] may facilitate to strengthen the capacity of documentations and implementations of procedures, putting and implementing objectives within written plans, with feedback, audit and reviews. Reporting of outputs of meetings, and tracing implementation is helpful to track changes. Quality improvement may not appear in the initial years of a program. Furthermore, effort to improve quality does not end and requires continuous action. As in this study, it took 10 years to have fruitful changes from 2007 up until 2016, which is highly observed in the hospital bed utilization indices.

For the current and future surgeon, EBS practice is a fundamental component of the surgical profession. Its universal adoption indicates the use of all the

knowledge from research, statistical methods, experience in judgment decisions and, lastly, leadership and management. The American College of Surgeons has also introduced the continuous quality improvement committee known as the office of EBS to promote the highest standards of surgical care through the evaluation of surgical outcomes in clinical practice [12]. Opinion leaders are influential in improving EBS practice, and surgical training was the most highly ranked influence on surgical practice [13]. Training curriculum provided a successful progression through improved rate of surgical skills acquisition, with regard to surgical performance [30].

In this study, the total number of surgeries was more or less stable, while skilled surgeries increased in number and almost doubled. This may be because of cumulative experience of surgeons over the years, which made it possible for selection of patients liable to major and skilled surgeries. There is a great improvement in major, advanced and skilled operations through the years, which is obvious from the increased trend especially from the year 2007 onwards; it almost doubled in 2016; this finding copes with the scope of the hospital, being a tertiary referral and specialized hospital. The clear vision adopted by the senior management leads to clear objectives with an action plan concerned with raising commitment and capacity of surgical staff by training local and international medical personnel, holding scientific meetings and reliance on evidence-based medicine, both in practice and research, improving the quality of medical care, and cumulative experience. Many new and modified surgical techniques were carried out, giving evidence that the research and practice were intermingled. Google scholar website for GSD, TBRI showed these practical researches. Some examples were referenced [31,32]. By far, the most frequent databases used by surgeons are PubMed and standard Google or Google scholar. Alternatively, they may go straight to a government guidelines website or even a systematic review database [12].

Conclusion and recommendations

The shift to more skilled and major surgical operations, the increase of elective surgeries, the increased outpatient flow, and decreased MR, and the improvement in hospital bed indices, decreased ALOS, increased BOR and increased BTR, are the indicators used to assess the implemented policies and procedures made to raise the surgical performance in GSD. It is recommended to have plenty of time to judge the observed changes to happen, more than 10 years from 2007 to 2016, to capture the improvement in utilization pattern and performance in GSD at TBRI hospital. It is also recommended to keep up policies and procedures to continue future improvement for better quality of care in GSD at TBRI hospital.

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Conflicts of interest

There are no conflicts of interest.

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