Analysis of the disease entities and typical characteristics of day surgery based on three Public Tertiary A hospitals in China

Ying Wang1, Hui Sun1*

1National Institute of Hospital Administration, National Health Commission of the People’s Republic of China, Beijing, 100044, China.

*Correspondence to: Hui Sun, National Institute of Hospital Administration, National Health Commission of the People’s Republic of China, Yard 6, South Shouti Road, Beijing, 100044, China. E-mail: sunhui@niha.org.cn.

Author contributions
YW performed the data analyses and wrote the manuscript; HS contributed to the conception of the study and helped perform the analysis with constructive discussions; all authors read and approved the final manuscript.

Competing interests
The authors declare no conflicts of interest.

Acknowledgments
The authors would like to thank National Institute of Hospital Administration for supporting data analysis related to the patient experience survey. We would also like to thank National Health Commission of the People’s Republic of China for providing grant support for this study.

Peer review information
Clinical Research Communications thanks Xiao-Lin Wu and another two anonymous reviewers for their contribution to the peer review of this paper.

Abbreviations

Citation

Abstract
Background: In recent years, day surgery has gained widespread attention in the medical industry. This thesis focuses on three tertiary general hospitals in different regions in China where day surgery has been carried out earlier, is more developed, has a more comprehensive range of day surgery procedures, and has an annual volume of 10,000 or more day surgery cases. The study will provide hands-on experience for other medical institutions to carry out day surgery. Methods: 67,337 valid items of data were retrieved from the Hospital Information Systems of the three hospitals. In this thesis, descriptive analysis was carried out on basic information about day surgery patients, including composition of patients’ major diseases, hospitalization costs. Non-parametric tests were used to compare the data in each group, the median and interquartile range were used to show the trend in the concentration of the relevant indicators. The difference was considered statistically significant at P < 0.05. Results: The largest proportion of day surgery patients were between the ages of 51 and 70. About 57.30% of day surgery patients paid for their medical care with the basic medical insurance of urban employees. Senile cataract, benign breast tumor, and endometrial polyp were the top three major diagnoses of day surgery patients. The average inpatient expenditure for day surgery patients was 8982.10 yuan, with consumables cost representing the highest proportion at approximately 46.01% of the total hospitalization cost, followed by treatment cost at around 31.01% of the total cost. Conclusions: Day surgery is more suitable for middle-aged patients and may not be the best choice for children and elderly patients over 80 years old. Most day surgery cases are elective surgeries for non-emergency situations. The distribution of day surgery patients is primarily concentrated in ophthalmic, breast, and reproductive system diseases, although each hospital has its own unique characteristics. The development of day surgery presents both economic and social benefits.

Keywords: day surgery; characteristics; patients
Background

Since 1840, American doctors Crawford Long, Horace Wells, and William Morton successfully implemented general anesthesia in outpatient settings, providing the technical foundation for performing day surgery [1]. In the early 1890s, Scottish doctor James Nicholl first proposed the concept of day surgery and conducted day surgeries on nearly 5,000 children with cleft lips, hernias, deformities of the feet, and mastoid diseases at the Royal Hospital for Children in Glasgow, establishing the prototype of modern-day surgery [2]. Subsequently, day surgery units and independent day surgery centers were established, with the United States having the first independently established day surgery center in 1970. Since then, the day surgery service model has been developed and widely implemented in developed countries such as Europe and America [3–5]. After more than 110 years of development, day surgery now accounts for up to 90 % of elective surgeries in European and American countries.

In 2001, day surgery was officially introduced to mainland China, and the development of the day medical model has rapidly gained attention from the industry as an innovative way to improve medical service efficiency and reduce medical costs. It has also been recognized and promoted by industry management departments. With the development of anesthesia and minimally invasive surgical techniques, as well as the promotion of accelerated recovery concepts, more and more diseases and procedures have been included in the day surgery catalog. Day surgery, with its characteristics of “short, flat, and fast” [6–8], has played a certain role in solving the problems of “difficult access to medical care” and “difficult surgeries,” prompting more and more medical institutions to try day surgery [9–10]. According to statistics, the volume of day surgeries in China has increased six-fold in the past seven years, and in 2021, nearly 70 % of third-level public hospitals in China have implemented day medical services.

From the current situation of day surgery in various countries, the definition of day surgery varies due to cultural, national, policy, and institutional differences. Day surgery in European and American countries refers to surgeries that do not require overnight hospital observation [11], while in China, day surgery mainly refers to a medical service model that provides patients with comprehensive diagnosis and treatment services within 24 hours while ensuring medical quality and safety [12].

Through literature search on day surgery in recent years, research on day surgery can be summarized into two levels: micro and macro. At present, domestic and international macro-level research on day surgery covers the entire process management of day surgery, such as the appropriate scope of day surgery, research on supporting performance allocation schemes, allocation and management of day surgery rooms, postoperative community rehabilitation, etc. [13–15]. High-frequency research at the micro level mainly involves anesthesia techniques and drugs, specific surgeries and procedures, nursing research, management and concept development, and quality and safety assurance, among which quality and safety have received the highest attention [16–21]. In addition, some countries with rapid development of day surgery also conduct research on the development trends of day surgery, annual development reports, and specialized research on day surgery [22–26]. However, there is limited in-depth research on the current situation of day surgery in China, and it is still limited to individual hospital levels, with limited relevance to other hospitals.

Data and methods

Research objects

The data collected in this research is sourced from the project “Comprehensive Hospital Evaluation System for Quality and Safety Management of Day Surgery” commissioned by the National Health Commission to our institution. In order to protect the privacy of institutions and patients, certain information in this database has been de-identified, such as hospital names, patient names, addresses, and personal information. Therefore, the three hospitals are referred to as B Hospital, R Hospital, and X Hospital, respectively. All methods were conducted in accordance with the relevant guidelines and regulations, including the Declaration of Helsinki. Ethics approvals for the patient experience survey and study were obtained from the ethics committee of National Institute of Hospital Administration.

Statistical analysis

Exclusion criteria for the data were as follows: (1) 86 cases of patients who were initially screened as day surgery patients upon admission but did not meet the discharge requirements on the same day and were subsequently converted to regular inpatient status; (2) 1,027 cases of patients who were not able to undergo day surgery for various reasons. A total of 67,337 patients were included in the analysis.

This study used Excel 2017 and SPSS 25.0 statistical software to analyze the annual day surgery patient medical record data of three hospitals in 2019. A descriptive analysis was conducted on the basic characteristics of day surgery patients, such as age distribution, gender composition, admission time, medical payment methods, main disease composition, surgical classification, and hospitalization expenses. For metric data that conform to a normal distribution, the mean and standard deviation were used to represent the central tendency of relevant indicators. If the variance homogeneity is satisfied, analysis of variance was used to compare multiple groups of data. For metric data that does not follow a normal distribution, the median and interquartile range were used to represent the central tendency of relevant indicators. If the variance is not homogeneous, non-parametric tests were used to compare the data of each group. For count data, the Z-test was used for comparison analysis. A difference was considered statistically significant at P < 0.05. The principles of disease classification are based on the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), while surgical procedures are classified according to the International Classification of Diseases Clinical Modification of 9th Revision Operations and Procedures (ICD-9-CM-3).

Result

Basic information of patients undergoing day surgery

From the results of the data analysis, the total number of day surgery patients in the three hospitals in 2019 was as follows: B Hospital had 36,870 cases, B Hospital had 19,066 cases and X Hospital had 11,401 cases. There were 31,270 male patients, which corresponds to 46.44 %, and 36,067 female patients, which corresponds to 53.56 %. The age distribution of day surgery patients was broad, with the youngest patient being only one month old and the oldest 96 years old. In terms of age distribution, the proportion of day surgery patients aged 61–70 years was the highest at 22.83 %, followed by patients aged 51–60 years at 16.69 %. These two age groups accounted for 39.52 % of the total number of day surgery patients (Table 1). The average age of day surgery patients was (52.27 ± 18.47) years. Looking at the gender of patients, the average age of female patients was (50.72 ± 17.85) years, with the age distribution mainly concentrated in the 61–70 and 31–40 age groups. On the other hand, the mean age of male patients was (54.06 ± 18.99) years, with the age distribution mainly concentrated in the 51-70 age group. The Kruskal-Wallis test was performed on patients of the age of day surgery in the three hospitals. The result was P < 0.05, indicating that there were statistically significant differences in the age of day surgery patients in the three hospitals. The average age of day surgery patients in X Hospital was (43.32 ± 17.04) years (Table 2), which was relatively young compared to the other two hospitals.

Looking at the admission pathway of day surgery patients, 95.21 % of day hospital patients are outpatients, 4.26 % are emergency patients and 0.52 % are patients referred from other medical facilities. In terms of the month of admission for day surgery patients, the lowest number of day surgery patients was in February with only 3469 cases, followed by November and January with 5182 and 5292 cases respectively. The other months fluctuated between (5611.42 ±
Disease distribution of day surgery patients

The classification and statistics of principal disease codes for day surgery patients in three hospitals are as follows: In R Hospital, the distribution of principal diseases among day surgery patients is relatively balanced. In first place are the eyes and adnexa diseases, which accounts for 7.76% of the total number of day surgery patients. The second most common disease is kidney and ureteral stones, which account for around 6.99%. In third place is coronary atherosclerosis, with 6.29%. In B Hospital, the diseases among day surgery patients are mainly distributed among eye and adnexal diseases (50.21%), non-inflammatory diseases of the female reproductive system (10.38%), and varicose veins (9.71%). These three types of diseases account for more than 70% of the total number of patients. In X Hospital, the most common disease among the day hospital patients is benign breast tumor, which accounts for 16.67% of the total number of patients. The second most common disease is that of the eyes and adnexa diseases, with about 11.53%. In third place is gallbladder stones, with a share of about 6.72% (Table 3).

Principal diagnoses distribution of day surgery patients.

Based on the number of principal diagnoses at patient discharge, the top five diagnoses in terms of proportion are senile cataract (H25.901), benign breast tumor (D24.x00.x001), endometrial polyph (N84.001), cataract (H26.900), and ureteral stones (N20.100). The number of patients with the top five principal diagnoses is 14,693, accounting for 21.81% of the total number of patients undergoing day surgery.

Classification of major operations for day surgery patients

Based on the analysis of the main surgical procedures performed on day surgery patients, the five procedures are cataract removal with implantation of an artificial lens (13.71001), minimally invasive rotational excision of breast lesions (85.2100x004), intravitreal drug injection (14.79004), laparoscopic cholecystectomy (51.2300), and transperineal prostate biopsy (60.1100x003). The top five discharge diagnoses accounted for 17,734 cases, representing 26.34% of the total number of day surgery patients, while the top fifteen discharge diagnoses accounted for 27,677 cases, representing 41.10% of the total number of day surgery patients.

Based on the analysis of hospitalization plans of patients discharged within three days of a day surgery procedure, there were 13,296 patients who planned to be readmitted within three days of discharge, which is approximately 19.75% of the total number of day surgery procedures. The highest proportion of readmission plans within three days of discharge was for intravitreal drug injection (14.79004), which accounted for 99.48%. This was followed by pars plana vitrectomy (14.74001), which accounted for 97.84%. In third place was surgery for extraocular muscle recession (15.11001), with a share of 90.27%.

Cost analysis of day surgery

Based on the analysis of the total hospitalization cost of day surgery
patients, the average hospitalization cost per surgery for male patients is 9197.67 yuan and for female patients is 8795.2 yuan (Table 4). Furthermore, the analysis of the difference in average cost between male and female day surgery patients in three research hospitals shows a P-value of 0.388 > 0.05, indicating that there is no statistically significant difference in average cost between male and female day surgery patients.

Among the patients discharged after day surgery, the elderly patients with age-related cataracts had the highest average hospitalization cost, which was (9543.27 ± 5628.95) yuan. The patients with lower limb varicose veins had the highest average cost for day surgery, which was (16965.05 ± 3643.41) yuan. The patients with ureteral stents removed had the lowest average cost for day surgery, which was (960.20 ± 1195.20) yuan (Table 5).

As for the proportion of the average hospitalization costs for day surgery patients, consumables accounted for the largest proportion, about 46.01% of the total hospital cost (Table 6). Consumables include disposable medical materials for examination, disposable medical materials for treatment, and disposable medical materials for surgery. The average consumable cost for the three hospitals is 4132.80 yuan. The next largest portion is the treatment cost, which accounts for about 31.01% of the total hospital cost.

| Table 3 Distribution of the top three diseases of day surgery patients in the hospitals |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| First place    | Eyes and adnexa disease | Eyes and adnexa disease | Non-inflammatory diseases of the female reproductive system | Eyes and adnexa disease |
| Proportion (%) | 7.76% | 50.21% | 10.38% | 11.53% |
| Second place   | Kidney and ureteral stones | Uterus and adnexa | Uterus and adnexa | Uterus and adnexa |
| Proportion (%) | 6.99% | 10.38% | 11.53% | 11.53% |
| Third place    | Coronary atherosclerosis | Varicose veins | Gallbladder stones | Gallbladder stones |
| Proportion (%) | 6.29% | 9.71% | 6.72% | 6.72% |

| Table 4 Average cost per gender of day surgery patients in the studied hospitals in 2019 |
|-----------------|-----------------|-----------------|-----------------|
|                  | Male            | Female          | Total           |
| B hospital       | 10561.67        | 9090.17         | 9674.26         |
| R hospital       | 8770.91         | 9106.30         | 8929.47         |
| X hospital       | 8722.22         | 7560.38         | 7994.81         |
| Total            | 9197.67         | 8795.20         | 8982.10         |

| Table 5 Average cost and standard deviation of the top 15 discharged patients with major diagnoses in the studied hospitals |
|-----------------|-----------------|-----------------|-----------------|
| The main diagnostic name of discharge | Primary diagnostic code for discharge | Average cost | Standard deviation |
| Senile cataract | H25.901 | 9543.27 | 5628.95 |
| Benign breast tumor | D24.x00x001 | 6878.08 | 2841.34 |
| Endometrial polyp | N84.001 | 4797.02 | 1358.60 |
| Cataract | H26.900 | 6593.32 | 759.74 |
| Ureteral calculus | N20.100 | 12922.37 | 4737.62 |
| Benign Prostatic Hyperplasia | N40.x00 | 8792.84 | 5810.78 |
| Exudative senile macular degeneration | H35.311 | 6929.88 | 763.10 |
| Gallstones with chronic cholecystitis | K80.101 | 13703.02 | 2379.34 |
| Malignant tumor of prostate | C61.x00 | 5929.76 | 3965.20 |
| Remove ureteral stent | Z43.603 | 960.20 | 1195.20 |
| Coronary atherosclerotic heart disease | I25.103 | 14118.82 | 13056.61 |
| Adenosis of breast | N60.201 | 6478.36 | 2299.14 |
| Varicos vein of lower limb | I83.904 | 16965.05 | 3643.41 |
| Malignant tumor of bladder | C67.900 | 7598.93 | 3246.63 |
| Kidney stone | N20.000 | 14114.10 | 6138.06 |

| Table 6 Average hospitalization costs of day surgery patients in the studied hospitals |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | Comprehensive medical service expenses | Diagnostic expenses | Therapeutic expenses | Rehabilitation expenses | Traditional Chinese medicine expenses | Western medicine expenses | Traditional Chinese drug expenses | blood and blood products expenses | Consumable expenses | Other expenses |
| B hospital       | 366.61 | 315.08 | 2386.91 | 0.00 | 0.00 | 1248.38 | 3.23 | 2.43 | 5351.64 | 0.00 |
| R hospital       | 368.30 | 1173.55 | 2885.62 | 0.13 | 0.13 | 732.09 | 8.83 | 0.87 | 3754.46 | 5.50 |
| X hospital       | 225.22 | 502.31 | 3125.02 | 73.07 | 885.84 | 734.20 | 13.84 | 0.32 | 3318.08 | 16.76 |
| Total            | 343.59 | 816.83 | 2784.95 | 14.29 | 2.84 | 878.66 | 8.09 | 1.22 | 4132.80 | 5.20 |

Submit a manuscript: https://www.tmrjournals.com/tcr
The next largest portion is the treatment cost, which accounts for about 31.01% of the total hospital cost. The treatment costs mainly comprise anesthesia fees, surgical fees and fees for non-surgical treatment procedures. The average treatment cost for the three hospitals is 2784.95 yuan. The next largest portion is the treatment cost, which accounts for about 31.01% of the total hospital cost. The treatment costs mainly comprise anesthesia fees, surgical fees, and fees for non-surgical treatment procedures. The average treatment cost for the three hospitals is 2784.95 yuan.

Discussion

Day surgery patients are mainly middle-aged and elderly patients. The study found that the age range of day surgery patients is broad, ranging from newborns to centenarians. However, patients aged 31-70 years account for about 70% of the total number of patients, and among the patients of different genders, 61-70-year-olds have the highest proportion, which is also consistent with the distribution of surgical age of patients. Among the three hospitals, Hospital X has the youngest average age of patients, and the leading disease distribution in this hospital is benign breast tumors, with an average age of only 35.51 years. It can be seen that middle-aged and elderly patients are the main group of day surgery patients, and each hospital has its own characteristics in terms of disease distribution for day surgery. Therefore, the focus of day surgery should not only be on the middle-aged and young population, but also on the needs of elderly patients, especially for common and widespread diseases. In view of the postoperative complications and the possible presence of chronic diseases, responsible medical institutions should exercise caution when admitting children and people over 80 years of age to day surgery.

The majority of patients who undergo day surgery are not emergencies. Day surgery is primarily intended for outpatients. For emergency patients with rapid onset and progression, day surgery is not the preferred option. Therefore, it is important to utilize information technology to schedule day surgery efficiently. In addition, surgical patients have a degree of autonomy in choosing their surgery date, which allows them to avoid awkward moments. As a result, most hospitals experience a decrease in surgery volume during the Spring Festival. When scheduling appointments for day surgery, hospitals can also take patient preferences into account and effectively allocate surgical resources to patients.

The distribution of diseases among day surgery patients is relatively concentrated and each has its own characteristics. From the above studies, it is easy to see that the disease distribution of day surgery patients in the three hospitals has both similarities and peculiarities, which are mainly reflected in ophthalmological diseases (H11, H25, H26, H34, H35, H44, H50, H65), breast diseases (D24) and reproductive system diseases (N84, N85). At the same time, each hospital performs some day surgery diseases that correspond to their own characteristics, depending on the specialization characteristics of their own hospital.

Ophthalmic diseases are the most common among patients undergoing day surgery, which may be related to the suitability of day surgery for these diseases. Phacoemulsification with implantation of an intraocular lens is currently the ideal treatment for cataracts. It has advantages such as small incision, no sutures, short duration, low risk of intraoperative and postoperative bleeding, fewer postoperative complications, and easier detection [27]. Daytime cataract surgery accounts for the vast majority of cataract operations in many European and American countries [28-29]. In addition, research has shown that cataract is the leading cause of blindness in China, and age-related cataract patients will constitute a large patient group. Cataract surgery is the only way to restore the vision of cataract patients [30], and the aging population in China has led to a continuous increase in the demand for ophthalmic disease treatment, which is one of the main reasons for the high number of elderly cataract patients.

The latest epidemiological survey found that breast cancer ranks first among malignant tumors in Chinese women, and with the addition of benign breast tumors and non-tumorous breast diseases requiring surgery, the demand for breast surgery is increasing. Since the beginning of the 21st century, with the continuous improvement of comprehensive diagnostic and treatment options, the overall prognosis of breast cancer has improved significantly, and the concept of maximum benefit with minimum harm has become widely accepted in clinical practice [31]. In recent years, the surgical concept of “achieving equivalent or better outcomes with minimal surgical trauma” has gained acceptance. With advances in anesthesia and recovery techniques, breast-conserving surgery, sentinel lymph node biopsies and breast-conserving plastic surgery for breast cancer are gradually being performed as day surgery [32]. Breast diseases, therefore, account for a large proportion of day surgery patients. Therefore, breast diseases account for a large proportion of day surgery patients.

Overall, the fifteen major disease types are common and widespread diseases that affect people’s health. Therefore, hospitals should expand the provision of day hospital services for common and widespread diseases, and the development of day surgery centers should also take this into account when allocating medical resources.

The day surgery model plays a positive role in controlling medical costs. Brebbia et al. [33] argue that the introduction of day surgery better reflects the evolution of modern medical care in the face of rising medical costs. Taking benign breast tumors as an example, Zhang Yidan [34], Liu Shufen [35], and others conducted comparative studies on day surgery and conventional inpatient surgery for this research topic. The study results showed that the average cost of inpatient surgery for benign breast tumors was 8021.1 ± 3862.4 and 9015.67 ± 3933.37, respectively, which was significantly higher than the average cost of day surgery analyzed in this study. The reasons for this are that day surgery can save not only the costs of hospitalization, beds, and nursing staff fees but also the hidden costs of long-term hospitalization, such as working leave, escort, and anti-infective drugs. For medical institutions, the cost structure of day surgery is more in line with the working idea of medical reform.

The high cost of consumables for patients in day surgery is mainly related to the high-end consumables related to minimally invasive surgery and the low level of development of the entire healthcare industry in China. Many consumables are still dependent on imported products, making consumables expenditure for day surgery patients. With the further implementation of the “Healthy China” strategy and the continuous improvement and optimization of the major healthcare industry, it is expected that the proportion of costs for consumables in the healthcare sector will fall significantly in the future, which will ultimately benefit a large number of patients.

Day surgery is helpful for improving the social performance of hospitals. On the one hand, the promotion of day surgery has led to a segmentation of the market according to different levels of medical demand and healthcare capacity by effectively diverting difficult and critically ill patients as well as patients with common single diseases so that patients with single diseases can be treated without occupying inpatient bed resources. This helps to balance the allocation of medical resources, alleviate the problem of imbalance between the supply and demand of medical resources, and maximize the utilization of bed resources, thereby increasing the value of hospital bed revenue and achieving a win-win situation for patients, hospitals, and society. At the same time, reducing medical costs not only relieves the burden on patients but also improves the efficiency of health insurance fund utilization, which helps to alleviate the pressure on health insurance funds and increase social benefits.

Submit a manuscript: https://www.tmrjournals.com/tcr
In conclusion, despite the risks in terms of medical safety, day surgery is becoming increasingly popular with both medical professionals and patients due to shorter hospital stays, lower medical costs, higher utilization of hospital beds, and higher turnover rate. Considering the current allocation of medical resources in China and the aging population, coupled with the “Healthy China” strategy, there is huge potential for the development of day surgery in China. However, it remains a challenging task to explore in a way that is consistent with the “Chinese characteristics” of day surgery. Moreover, it is a long-term problem that requires continuous research and exploration on how to improve and develop our own model of day surgery.

References


