

Hospital-Acquired Conditions of a Grade A hospital in China

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Abstract

Background: This study aimed to investigate the Hospital-Acquired Conditions (HACs) and find deficits in our hospital, so as to improve the incidence of HACs in China from our retrospect. **Methods:** We conducted statistics on the incidence and the percentage of HACs, and managed the cost and length of stay of the 950 patients went through HACs in our hospital from 2016 to 2018. **Results:** The overall incidence was 0.571%. The two most common conditions with the most cost were deep vein thrombosis (DVT) and pulmonary embolisms (PE) (351), and surgical site infections (SSI) (143), which were followed closely by manifestations of poor glycemetic control (53), vascular catheter-associated infections (VCAIs) (52), stage III and IV pressure ulcers (49), catheter-associated urinary tract infections (CAUTIs) (33), and falls and trauma (30). Iatrogenic pneumothorax with venous catheterization (7) only occupied small portions. Blood incompatibility and air embolism didn't happen in the three years. **Conclusions:** From the comparison of three years, the condition decreased in 2017, while met a higher increase in 2018. This may relative to the launch of medical reform in 2017. Chinese hospitals still need to investigate the HACs, give adaptable emphasis and concern to improve, and promote the overall level of medical management.

Introduction

The attention on Hospital-Acquired Conditions (HACs) can date back to more than 40 years ago in the USA, and the definition is harmful secondary events occurring in a hospital setting during a patient's evaluation or treatment ¹. HACs not only result in extra medical resource but also increase an individual's financial burden and medical insurance waste. Prolonged hospitalization, usually for parenteral antibiotic treatment, accounts for more than three-fourths of this cost ². The delayed discharge also increases the risk of additional harm whether physically or psychologically, and sometimes is even unrelated to the original reason for hospitalization. From the point of view of the doctor-patient relationship, the newly occurring diseases during patients' hospitalization could lead a tense situation and become the fuse of doctor-patient disputes.

Many countries in the USA carried out multiple kinds of research on this HACs ³. According to the famous Harvard medical practice study, adverse events occurred in 3.7% of the hospitalizations, most of the adverse events gave rise to disability lasting less than 6 months, and 2.6% caused permanently disabling injuries and 13.6% led to death. However, 27.6% of the adverse events were due to negligence ⁴. Some researches pointed out specific medical problems and analyzed the risk factors. On the problem of nonpayment after total joint arthroplasty, Kyle R et al. found that nearly 70 million dollars' hospital costs would be lost annually on the HAC after receiving this surgery ⁵. Except for the discovery of economic waste, HACs can be considered as an observable indicator to provide a chance to find out the factors of both sides, which can predict the development and benefit patients and doctors. For example, J. Cromarty et al. reported diabetes patients with end-organ sequelae have increased length of stay⁶, which emphasized the importance of manifestations for glycemetic control. All those conclusions can remind us of the sense of HACs, and guide us to specify response policies to realize the functions of hospitals directionally.

In Australia, HACs are used as monitoring indicators for hospital medical quality, patient safety and medical management⁶. The paying for The Centers for Medicare and Medicaid Services (CMS) has been moved from the volume of services they provide to the quality of those services (the latter is known as the pay-for-performance model), and they focused on improving care quality in acute care hospitals by these programs: the Hospital Value-Based Purchasing (HVBP) program, the Hospital Readmission Reduction Program (HRRP), and the HAC reduction program¹. As a pay-for-performance initiative, the CMS nonpayment policy is intended to improve the quality of care to reduce HACs and decline unnecessary health care expenditures⁸. However, what calls into question are the validity of the HACRP and its risk adjustment, due to the sensitivity of the HACRP penalties to small changes in performance and the correlation of the HACRP score with hospital characteristics⁹. The policies on HACs still need consistent improving.

At present, most ideas, from the point of hospital infection, nursing, and adverse drug reactions to report the HACs, were proposed by doctors or nurses. There is a lack of systematic viewpoint of medical care, patient safety and management of HACs from the medical administrator in China. Strengthening the analysis, research, and management of HACs has become one of the most important works in international hospitals. To implement the research and management of HACs in China, the previous Ministry of Public of China asked to enable a new medical record homepage and heavily commented “present on admission (POA)”. They suggested that we should enhance medical staff’s recognition of HACs by filling and attaching importance to the condition of admitted patients to improve the quality of medical work, ensure patients’ safety, and reduce the waste of medical resources. But because of little emphasis, this project brought little effect. We retrospect the events of HACs in all in-hospital patients in our hospital from 2016 to 2018, compared the incidence rate, basic characters of patients, the financial costs, and the length of hospitalization in order to find the underlying trend of patterns to explain the reason and improve the medical service and medical management.

Methods

Our Hospital is one of the best neurological hospitals in China, approving 981 beds and more than 4000 staffs. There are more than 1,800,000 patients and over 30,000 operations per year. The patient demographic values and health characteristics in this study were collected by the medical affairs department of Our Hospital and were available for analysis. The current research included all the in-hospital patients in our Hospital from 2016 to 2018. All the procedures followed were in accordance with the ethical standards of the Helsinki Declaration of 1975, as revised in 2000.

According to the CMS nonpayment policy, 11 hospital-acquired conditions are classified as preventable conditions: foreign objects retained after surgery, air embolism, blood incompatibility, stage III and IV pressure ulcers, falls and trauma, manifestations of poor glycemic control, catheter-associated urinary tract infections (CAUTIs), vascular catheter-associated infections (VCAIs), surgical site infections (SSI), deep vein thrombosis (DVT) and pulmonary embolisms (PE), and iatrogenic pneumothorax with venous catheterization¹⁰. We counted all the patients who met with the HACs criteria by ICD-10-CM, and the total number of each HAC and the incidence rate of them were calculated from 166463 in-hospital patients in three years from 2016 to 2018 (Table 1). Demography, finance, and length of hospitalization information were shown in Table 1. We also compared these conditions among the three years.

Results

166463 in-hospital person-time’s records were identified in our hospital database from 2016 to 2018, and separately 54163 in 2016, 53480 in 2017, and 58820 in 2018. In three years, 950 patients underwent HACs (separately, 311 in 2016, 296 in 2017 and 343 in 2018). The overall incidence was 0.571% (separately, 0.574% in 2016, 0.553 in 2017 and 0.583 in 2018), and the two most common conditions were DVT and PE (36.79%, 351) and SSI (14.99%, 143). Interestingly, DVT and PE happened in 351 patients with the eldest mean age, while the patients with SSI had the youngest age in all in-patients in three years. It is worth noting that intraoperative devices such as the joint in an arthroplasty, vascular stent, cardiac valves, and so on were also thought as foreign objects retained after surgery according to ICD-10-CM. They weren’t considered as HACs,

so there were no other conditions of foreign objects retained after surgery in our hospital. Manifestations of poor glycemic control ranked third with 5.56% (53), and followed closely by VCAs with 5.45% (52), stage III and IV pressure ulcers with 5.14% (49), CAUTIs with 3.46% (33), and falls and trauma with 3.14% (30). Meanwhile, the proportion of iatrogenic pneumothorax with venous catheterization was less than 1% separately. Air embolism and blood incompatibility didn't happen.

From an economic perspective, the total costs of the patients with SSI and DVT and PE ranked in 1st, and 2nd. Stage III and IV pressure ulcers and falls and trauma ranked in 1st and 2nd from the mean length of hospitalization (Table 1). Economically, stage III and IV pressure ulcers took the most averaged to every in-patient.

When comparing these conditions among three years, we saw that the occurrence rate of stage III and IV pressure ulcers, and DVT and PE became less and less. However, most of the conditions were increasing, and the total number increased in 2018 though it underwent a decrease in 2017. About the financial information of three years, no more trends can be seen, except the gradually reduced mean cost of CAUTIs. In addition, there was no rule can be found in the length of hospitalization (Figure 1, Supplementary Table 1, 2).

Discussion

To the best of our knowledge, this is the first report about HACs in China. In the current study, we calculated the incidence rate, mean cost and mean length of stay of HACs in three years, totally and separately. The most two common HACs in our hospital were DVT and PE, and SSI. Meanwhile, the presence of these two conditions in economic situations still needs to be attached importance. And they were followed closely by stage III and IV pressure ulcers with the highest mean cost and longest length of stay. Some situations had a relationship with the policy in China, and some improvements should have been done.

In western countries, venous thromboembolism (VTE), comprising PE and DVT, has become a major public health problem and is estimated to be the third most common cardiovascular event^{11, 1211, 1211, 12}. According to the research of Chen Wang, in the 105,723 identified patients with VTE, hospitalization rate increased from 3.2 to 17.5 per 100,000 populations, in-hospital mortality decreased from 4.7% to 2.1%, and the mean length of stay declined from 14 to 11 days from 2007 to 2016. In addition, the hospitalization rate of VTE was higher in elderly male patients, same with the patients with PE and DVT¹³. Recently there is an increasing awareness of VTE diagnoses in physicians, along with an improvement in diagnostic techniques for the identification and more effective treatments. In China, another reason may contribute to the trends. Hospitalization itself is already recognized as an important risk factor for VTE, and inadequate prophylaxis may also contribute to the rise in incidence of VTE. We also found that patients with PE and DVT had the oldest mean age compared with other conditions, which may partly explain the reason of its occurrence. Older patients tend to be too weak to move, which is easier to form thromboembolism.

Despite nearly 2 centuries of medical progress, SSIs still played a major role in the evolution of medical care throughout history, continuing to be a leading component of nosocomial morbidity and mortality. Moreover, the management of surgical infection remains a pressing concern. However, the risk factors for SSI originate from a patient and operative factors are multitudinous¹⁴. From the perspective of patients, most of the factors can't be controlled, while hospitals should take the responsibility to prevent SSI from the pre-operation, intra-operation, and post-operation. As to the conditions with high incidences, such as VTE/PE and SSI, medical staffs need to operate more evaluations on patients to assess the severe situation and predict the risk factor. Patients with different scores should be classified into different risk stratifications and given different treatments and prevention strategies. Though not all HAC-related patient harm events can be preventable, current efforts to create and validate specific risk scores for various clinical subgroups will likely help to reduce those events¹⁵. But in the view of the policy of antibacterial (mentioned below), SSI may make a difference in the following years.

The mean cost of individuals with CAUTIs reduced gradually. A possible explanation may be the beginning of healthcare reform in Beijing announced by the Health Commission of Beijing. It emphasized that medical treatment and drug sales should be separated, and we would abolish medicine markups, mandate transparent

drug purchase, establish medical service fee, adjust prices of 435 medical services, and promote rational use of medicines. More than 3600 hospitals and medical institutions in Beijing have launched health care reform since April 8, 2017. Meanwhile, our hospital stipulated that the management system of clinically antibacterial application must be performed seriously. This rule included that antibacterial information and technical support for clinical application must be provided to clinical medical personnel, patients must be reasonably guided to take antibiotics by medical personnel. In addition, medical personnel should also evaluate and check the use of antibiotic prescription and doctor's advice, and report the relevant situation to the outpatient department and the medical affairs department on time. They should carry out dynamic monitoring, abnormal early antibacterial warning, and adverse events. Doctors are also required to randomly check the use of antibiotic agents in patients, and be in response to give the feedback of the unreasonable use to the relevant departments. In the setting of this loop-locked policy, the mean cost of SSI and VCAIs in 2018 received a good effect compared with those in 2017.

Manifestations of poor glycemic control ranked third. In previous research, diabetes patients have consistently higher rates of Classification of Hospital Acquired Diagnoses and longer length of stay than similar patients with complex and chronic conditions⁶. HACs' different occurrences were significantly shown in diabetic patients, particularly the diabetic patients with end-organ sequelae, because they are known to be more vulnerable to infections, and other common complications, such as metabolic (primarily fluid imbalance), renal and cardiovascular complications are also danger⁶.

As the results show, stage III and IV pressure ulcers occupied the highest mean cost and longest mean length of stay, which imposes a substantial financial burden on the medical insurance system and patients. When expenditures are constrained, the need for high-quality health care and additional pressure ulcer specific recommendations are necessary to balance the benefit and the cost on preventing and treating, and their impact on patients, healthcare, and society¹⁷.

Since the Hospital-Acquired Condition Reduction Program (HACRP) was established, hospitals that are in the lowest-performing quartile (by HACRP score) will be penalized by reducing their payment by 1%. This program completed its goal of improving the quality of health care through financial rewards and penalties combining with two other Medicare programs (the HVBP and the HRRP)^{18, 19}. However, there is still no policy about reducing HACs in China. So in the trend of three years, no matter in number, percentage, or economic conditions, we didn't see a declining phenomenon, but a growing trend, such as CAUTIs, VCAIs, manifestations of poor glycemic control, and SSI. The total number and percentage are growing, though the total number of inpatients was also increased. One thing that is worth noticing is that the events of air embolism and blood incompatibility are limited to 0 in the three years. Another one is that the mean cost of individuals with CAUTIs reduced. A possible explanation may be the medical reform in the city.

It is urgent to improve our awareness of the importance of HACs and to strengthen the systematic analysis, research, and management of hospital acquisition. The correct analysis and evaluation for the occurrence of HACs, the standardization of medical behavior in accordance with evidence-based medicine guidelines, and reasonable prevention and reduction of HACs benefit to reduce the waste of medical resources and improve patient safety. Health administration departments and hospital management should raise awareness of the importance of hospital acquired problems and take practical measures to reduce its occurrence. To strengthen the management of HACs, we should consider it as an important work of hospitals and medical quality management, or a joint point to constantly improve the level of hospitals and medical treatment, to ensure patients' safety. At present, it has become an imminent task for the hospital management in our country.

Conclusion

In the current study, we summarized the situation of HACs in a Chinese Grade A hospital from 2016 to 2018. From the data of three years, DVT and PE, and SSI ranked first and second with an absolute quantity and percentage among other conditions. Meanwhile, the mean age of inpatients with DVT and PE was much beyond other conditions, which may due to being lacking in the evaluation and the guidance of exercise

for high-risk patients. And there is no doubt that the total cost of them occupied the first and second. On the other hand, the mean cost of individuals with stage III and IV pressure ulcers was the most due to the longest length of stay, which may cause the events in return. The mean cost of CAUTIs reduced gradually, and the conditions relative to infection in 2018 reduced compared to those in 2017, which cannot be separated from the policy of medical reform in Beijing. From the results mentioned above, we can make a conclusion that the changes in HACs are urgent to make, and those improvements can't be pulled off without the supervision and support of policy and rules, which has been an imminent task in the hospital management in our country.

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Table 1. The amount, percentage, demographic, financial and length information of all inpatients for Hospital-Acquired Conditions in three years.

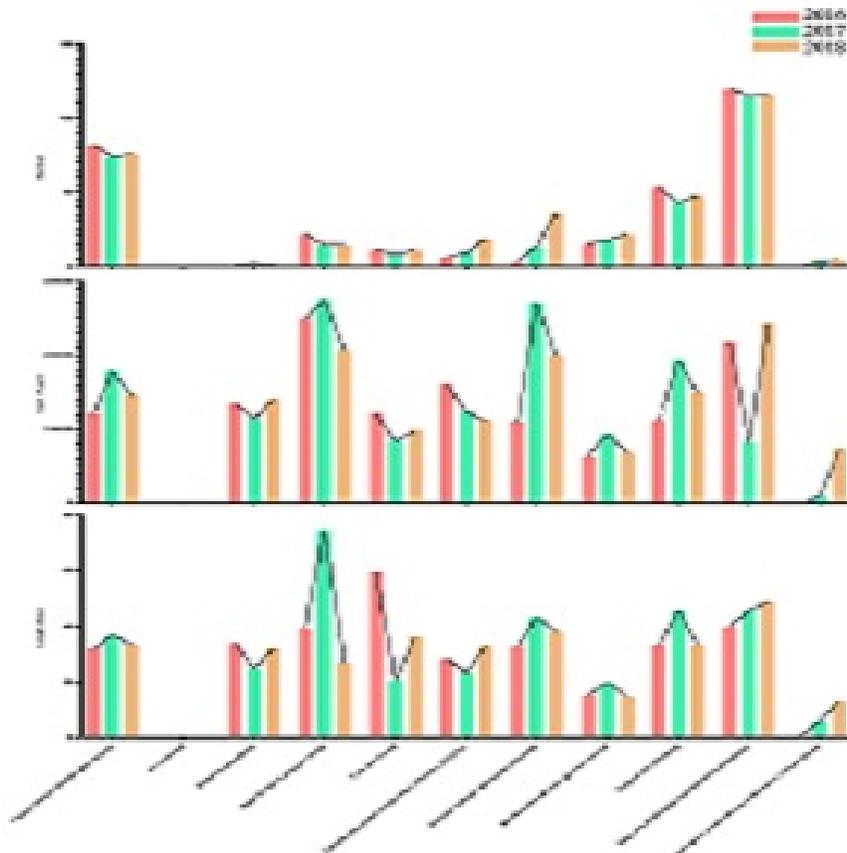
NO.	HAC	ICD-10-CM	Amount	Incidence rate	Percentage	Gender (male/female)	Age (mean±std)	Total cost hospitalization	Mean cost of hospitalization (mean±sd)
1	Foreign objects retained after surgery	T81.5	232	0.139%	24.421%	122/110	58.63±18.16	37034618.00	147197.30±1
2	Air embolism	T79.0	0	-	0.00%	-	-	-	-
3	Blood incompatibility	T80.3, T80.4	0	-	0.00%	-	-	-	-
4	Stage III and IV pressure ulcers	L89.2, L89.3	49	0.029%	5.158%	36/13	59.67±20.02	11962081.69	243581.00±2

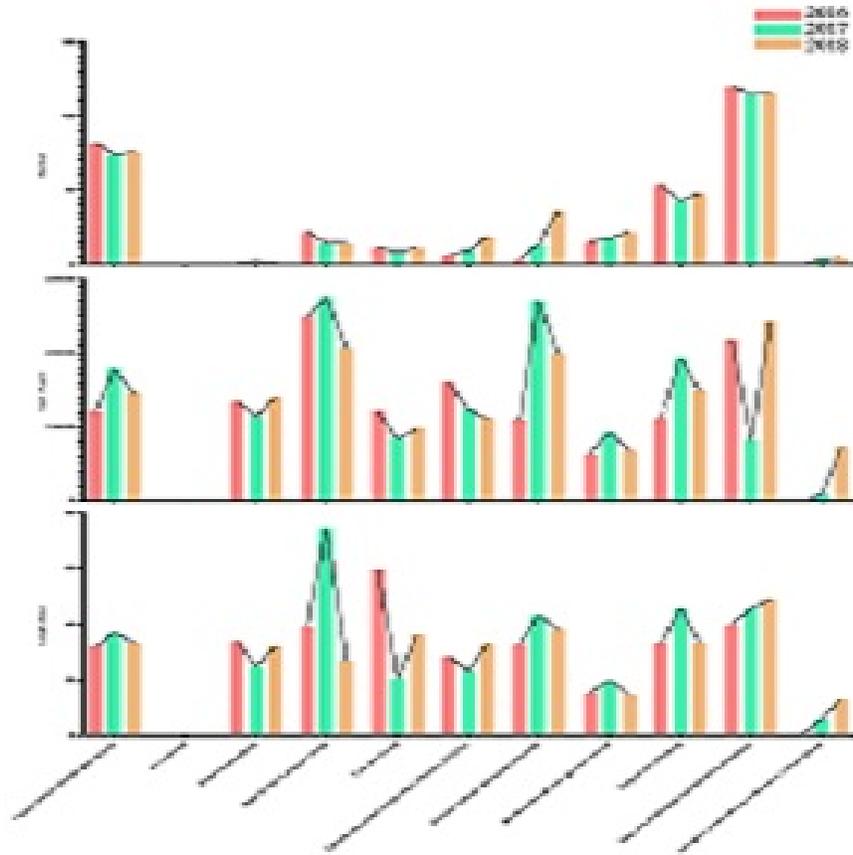
5	Falls and trauma	S02, S12, S22, S32, S42, S52, S62, S72, S82, S92, T02, S03, S13, S23, S33, S43, S53, S63, S73, S83, S93, T03, S06, S07, S17, S28, S38.0, S38.1, S47, S57, S67, S77, S87, S97, T04	30	0.018%	3.158%	13/17	59.60±17.313094556.32	103151.90±1
6	Catheter-associated urinary tract infections	T83.5	33	0.020%	3.474%	17/16	62.61±19.744089006.57	123909.33±1
7	Vascular catheter-associated infections	T82.7	52	0.031%	5.474%	35/17	60.13±17.6610997791.21	211496.51±1
8	Manifestation of poor glycemic control	E10-E14	53	0.032%	5.579%	28/25	60.36±13.993965300.58	74816.98±80
9	Surgical site infections	T81.4, T82.7	143	0.086%	15.053%	71/72	58.92±17.3721230513.00	148465.10±1

10	Deep vein thrombosis and pulmonary embolisms	I80.1, I80.2, I26	351	0.211%	36.947%	184/167	66.10±14.14	20076067.71	80408.75±11
11	Iatrogenic pneumothorax with venous catheterization	J95.8	7	0.004%	0.737%	3/4	61.14±9.75	314986.96	44998.13±55

Legend

Figure 1. The amount, incidence rate and economic information of all inpatients for Hospital-Acquired Conditions from 2016 to 2018.





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