Effect of the China NCDP policy on anticoagulation selection and hemorrhage events in patients with AF in Suining

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Abstract

Background: China began to launch the National Centralized Drug Procurement (NCDP) policy in March 2019 to improve public hospitals’ drug use model. After non-vitamin K antagonist oral anticoagulants (NOACs) entered the purchase list, medical institutions in Suining County of Xuzhou began to widely use NOACs on March 1, 2020. **Objective:** To study the effect of the NCDP policy on anticoagulation, medication, and hemorrhage events in patients with non-valvular atrial fibrillation (AF) in Suining. **Methods:** In this study, we used the hospitalization data of the Department of Cardiology of Suining County People’s Hospital from January 1, 2017 to June 30, 2022. General data collected included sex, age, type of health insurance, admission year, hospitalization costs, anticoagulants, use of anticoagulants, etc. Stroke risk stratification of patients with AF using CHA2DS2-VASc score classified patients with CHA2DS2-VASC score ≥ 2 as high risk and those with CHA2DS2-VASC score < 2 as medium and low risk. **Results:** 3,986 patients with non-valvular atrial fibrillation (NVAF) were analyzed in the study. 1. The cost after procurement was significantly higher for hospitalized patients than it was before the implementation of the policy (8900.57 ± 9023.02 CNY vs 9829.99 ± 10886.87 CNY, P < 0.001). 2. The proportion of oral anticoagulants increased significantly after the NCDP policy (40.02% vs 61.33%, P < 0.001), especially the use of NOACs among them (15.41% vs 90.99%, P < 0.001). 3. The proportion of patients with hemorrhage events decreased significantly after the implementation of the NCDP policy (1.88% vs 0.66%, P = 0.01). 4. In the 219 re-hospitalized patients, the anticoagulant rate increased significantly after the NCDP policy (36.07% vs 59.82%, P < 0.001), the use of NOACs increased significantly among them (11.39% vs 80.92%, P < 0.001). 5. Whether the patient changes the type of anticoagulant or not has nothing to do with age, type of health insurance, hospitalization cost, and antiplatelet. The NCDP policy (OR = 511.703, 95% CI = 103.879, 2520.618, P < 0.001) is the only factor that affects the change of anticoagulant type. **Conclusion:** The NCDP policy improves the anticoagulant rate and drug compliance in patients with AF, and significantly reduces hemorrhage events. The NCDP policy is the only factor that affects the change of anticoagulant type.
2. RuiLi Wang, he is currently the director of the Department of Cardiology, Suining County people’s Hospital. He is good at the treatment of various complex vascular lesions of coronary heart disease and other diseases and the management of critically ill patients.

3. Joshua Daniel Male, currently studying at Xuzhou Medical University, helping to collect data.

4. Qiu Meng is working in the Department of Cardiology of Suining County people’s Hospital, helping with data collection. She is good at the diagnosis and treatment of coronary heart disease, hypertension and other diseases and the management of critically ill patients.

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Ethic statement

The ethical approval was obtained from the ethical committee of Suining County people’s Hospital: (Ref no: No.LL-2022-39).

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Results: 3,986 patients with non-valvular atrial fibrillation (NVAF) were analyzed in the study. 1. The cost after procurement was significantly higher for hospitalized patients than it was before the implementation of the policy (8900.57 ± 9023.02 CNY vs 9829.99 ± 10886.87 CNY, P < 0.001). 2. The proportion of oral anticoagulants increased significantly after the NCDP policy (40.02% vs 61.33%, P < 0.001), especially the use of NOACs among them (15.41% vs 90.99%, P < 0.001). 3. The proportion of patients with hemorrhage events decreased significantly after the implementation of the NCDP policy (1.88% vs 0.66%, P = 0.01). 4. In the 219 re-hospitalized patients, the anticoagulant rate increased significantly after the NCDP policy (36.07% vs 59.82%, P < 0.001), the use of NOACs increased significantly among them (11.39% vs 80.92%, P < 0.001). 5. Whether the patient changes the type of anticoagulant or not has nothing to do with age, type of health insurance, hospitalization cost and antiplatelet. The NCDP policy [OR = 511.703, 95% CI (103.879, 2520.618), P < 0.001] is the only factor that affects the change of anticoagulant type.

Conclusion: The NCDP policy improves the anticoagulant rate and drug compliance in patients with AF, and significantly reduces hemorrhage events. The NCDP policy is the only factor that affects the change of anticoagulant type.

Keywords: NCDP policy, NOACs, anticoagulation, Hemorrhage

Highlights:
1. People have paid more attention to its role in reducing drug prices and drug expenditure after China’s NCDP policy, but few people have studied the impact of this policy on patients.
2. This is the first study on the impact of China’s NCDP policy on patients with AF in grass-roots areas.
3. The anticoagulant and utilization rate of NOACs in AF patients increased significantly after NCDP policy, the NCDP policy is the only factor that affects the change of anticoagulant type.

Atrial fibrillation (AF) is one of the most common arrhythmias in the clinic, causing a heavy burden to patients, families and the health care system. According to statistics, the current prevalence of AF in adults is between 2% and 4%. However, due to prolonged life expectancy and monitoring of AF[1], the prevalence of AF is expected to increase by 2.3 times[2-4]. According to the CHS study[5] from 2012 to 2015, the prevalence rate of AF among Chinese residents over 35 years old was 0.7%. The prevalence rate of AF in rural areas (0.75%) was higher than that in urban areas (0.63%). Non-vitamin K antagonist oral anticoagulants (NOACs) and vitamin K anticoagulants (VKA) are commonly used as the first choice for stroke prevention in patients with AF, especially in patients who have just begun anticoagulation therapy[6]. According to a survey of 1,252,703 adults over 40 years old by the China Stroke Screening Program[7] (CNSSS) from 2013 to 2014, 12% of ischemic stroke patients in China were complicated with AF. It is estimated that there are more than 2.15 million ischemic stroke patients with AF in China. However, the proportion of these patients receiving anticoagulation therapy is deficient, about 2.2%, of which 98.2% of the drugs are VKA.

The long-standing problem of “using medicine to support doctors” in China leads to a high proportion of unreasonable drug usage. The price of drugs affects the overall cost of treatment and is also the primary determinant of drug affordability[8]. Some studies[9-10] have proved that volume procurement positively affects the decline in the price of drugs that win the bid. Many countries have successful cases of reducing drug prices and saving drug costs through centralized drug procurement[11-12]. In order to improve the drug use model of public hospitals and solve the long-standing problem of “difficult in seeing a doctor and drug adherence,” China began vigorously promoting the NCDP policy in March 2019.

As of August 2021, the NCDP policy has entered the fifth round, involving a total of 219 drugs, including 30 drugs of the central vascular system[13], new oral anticoagulants are also covered by the policy. The average price of the first batch of bid-winning products was reduced by 52%, with a maximum price reduction of 96%[14]. According to statistics[15], Chinese patients have significantly increased their ability to pay for drugs covered by the NCDP policy. The ”4-7” policy has positively reduced drug prices and promoting rational drug use[16-18].
However, at present, people are concerned about the role of the NCDP policy in reducing drug prices and drug expenditure and seldom study the impact of this policy from the patient level. The primary purpose of this study is to compare the gender, age, bleeding event, types of anticoagulants and hospitalization costs of patients with AF in Suining County People’s Hospital before and after the procurement in order to explore the impact of the NCDP policy on patients with AF in Suining, Xuzhou.

1. Materials and methods

1.1 Materials

As shown in Figure 1, consecutive patients diagnosed with non-valvular AF were admitted to the Department of Cardiology of Suining County People’s Hospital from January 1, 2017 to June 30, 2022. Statistics of patients’ general data, clinical data and so on. Inclusion criteria: (1) age > 18 years old; (2) patients diagnosed as non-valvular AF according to 2020 ECS/EACTS AF diagnosis and Management guidelines[19]. Exclusion criteria: (1) the clinical data were incomplete. (2) there are contraindications in anticoagulation therapy, such as severe anemia (hemoglobin < 60g/L) or abnormal blood coagulation, bleeding tendency, active ulcer, etc. (3) AF caused by other reversible factors (such as hyperthyroidism, etc.); (4) rheumatic heart disease, valvular AF. Initially the study began with 4,264 people, 278 people were excluded, and finally the study proceeded with the remaining 3,986 people.

Figure 1. Research flow chart

1.2 Methods

General data of patients were collected: age, sex, type of medical insurance, clinical data: type and quantity of concomitant diseases, CHA2DS2-VASc score[20], hospitalization expenses, and use of anticoagulants. Finally, 3,986 people were included in this study.

1.3 Statistical analysis

The data were analyzed by SPSS 22.0 statistical software. The measurement data in accordance with the normal distribution are represented by (x ± s) and compared with the independent sample T-test. The counting data were expressed by example (%) and compared by Pearson χ² test. Univariate Logistic regression analysis was used to analyze factors affecting anticoagulation. The difference was statistically significant (P < 0.05).

2. Results

2.1 Descriptive analysis
3,986 cases meeting the inclusion criteria were included from January 1, 2017, to June 30, 2022. The average age was 76.58 ± 11.24 years old. As shown in Table 1, there were 2,010 males (50.43%) and 1,976 females (49.57%). 120 people had no medical insurance (3.01%) and 3,866 had medical insurance (96.99%).

2.2 Comparison of General data before and after the NCDP policy

As shown in Table 1, 1,521 males (49.37%) and 1,560 females (50.63%) were hospitalized before the NCDP policy; there were 455 males (50.28%) and 450 females (49.72%) after the NCDP policy. There was no significant difference in gender before and after the implementation of the NCDP policy ($\chi^2 = 0.231, P > 0.05$). The average hospitalization cost before the NCDP policy was 8,900.57 ± 9,023.02CNY, and that after the NCDP policy was 9,829.99 ± 10,886.87CNY. The hospitalization cost before the NCDP policy was significantly lower than that after the NCDP policy ($F = 13.258, P < 0.05$). Among the patients before the NCDP policy, 99(3.21%) had no medical insurance, the remaining 21 (2.32%) were hospitalized without medical insurance after NCDP. There was no significant difference in the type of medical insurance before and after the NCDP policy ($\chi^2 = 0.910, P > 0.05$). According to the CHA2DS2-VASc score standard, the average score was 2.93 ± 1.43 points before the NCDP policy and 3.17 ± 1.49 points after the NCDP policy. There was no significant difference before and after the NCDP policy ($P > 0.05$).

3081 patients were hospitalized before the NCDP policy, of which 1233(40.02%) patients were on oral anticoagulant drugs (VKA, NOACs) and 1848(59.98%) did not take; 1043(84.59%) took VKA orally before NCDP and 190(15.41%) took oral NOACs. After NCDP, there were 905 patients hospitalized, 555(61.33%) were treated with anticoagulants, and 350(38.67%) refused to take 50(9.01%) were treated with VKA, 505(90.99%) were treated with NOACs. The proportion of oral anticoagulants and oral NOACs increased significantly after NCDP ($\chi^2 = 71.183, 920.129, P < 0.001$).

Table 1. Comparison of General data before and after the NCDP policy.

<table>
<thead>
<tr>
<th></th>
<th>Before NCDP</th>
<th>After NCDP</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1521(49.37%)</td>
<td>455(50.28%)</td>
<td>$\chi^2 = 0.231$</td>
</tr>
<tr>
<td>Female</td>
<td>1560(50.63%)</td>
<td>450(49.72%)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>77.23±11.194</td>
<td>74.37±11.133</td>
<td>$F = 0.117$</td>
</tr>
<tr>
<td>Expenses</td>
<td>8900.57±9023.02</td>
<td>9829.99±10886.87</td>
<td>$F = 13.258$</td>
</tr>
<tr>
<td>Type of medical insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-medical insurance</td>
<td>99(3.21%)</td>
<td>21(2.32%)</td>
<td>$\chi^2 = 0.910$</td>
</tr>
<tr>
<td>Medical insurance</td>
<td>2982(96.79%)</td>
<td>884(97.68%)</td>
<td></td>
</tr>
<tr>
<td>CHA2DS2-VASc score</td>
<td>2.93±1.43</td>
<td>3.17±1.49</td>
<td>$F = 3.215$</td>
</tr>
<tr>
<td>Anticoagulant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral anticoagulant</td>
<td>1233(40.02%)</td>
<td>555(61.33%)</td>
<td>$\chi^2 = 71.183$</td>
</tr>
<tr>
<td>No oral anticoagulant</td>
<td>1848(59.98%)</td>
<td>350(38.67%)</td>
<td></td>
</tr>
<tr>
<td>Oral drug type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VKA</td>
<td>1043(84.59%)</td>
<td>50(9.01%)</td>
<td>$\chi^2 = 920.129$</td>
</tr>
<tr>
<td>NOACs</td>
<td>190(15.41%)</td>
<td>505(90.99%)</td>
<td></td>
</tr>
</tbody>
</table>

2.3 Analysis of the effect of antiplatelet therapy on anticoagulation before and after the NCDP policy

Figure 2 shows that before the NCDP policy, 1,347 patients were treated with antiplatelet therapy, of which 333 were treated with anticoagulation, encompassing 280 patients (84.08%) treated with VKA anticoagulation and 53 patients (15.92%) treated with oral NOACs. 1,734 patients did not take oral platelets, 900 patients took anticoagulants, of which 763 patients (accounting for 84.78%) took VKA, and 137 patients (accounting for 15.22%) took NOACs. After the NCDP policy, 301 patients were treated with antiplatelet therapy, 148 patients were treated with anticoagulant therapy, 8 patients (5.41%) were treated with oral...
VKAs, 140 patients (94.59%) with oral NOACs, 604 patients refused oral platelets, 407 people took anticoagulants, 42 people (10.32%) took VKA, 365 people (89.68%) took NOACs. There was no effect on the types of antiplatelet anticoagulants before and after the NCDP policy. ($\chi^2=0.090 \cdot 3.197$, $P>0.05$). (Detailed data are shown in Table 2).

![Figure 2](attachment:image.png)

**Figure 2. Analysis of the effect of antiplatelet therapy on anticoagulation before(A) and after NCDP(B).**

**Table 2. The effect of antiplatelet therapy on anticoagulation before and after NCDP**

<table>
<thead>
<tr>
<th>Group</th>
<th>Before NCDP</th>
<th>Before NCDP</th>
<th>After NCDP</th>
<th>After NCDP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VKA</td>
<td>NOACs</td>
<td>VKA</td>
<td>NOACs</td>
</tr>
<tr>
<td>Antiplatelet</td>
<td>280(84.08%)</td>
<td>53(15.92%)</td>
<td>8(5.41%)</td>
<td>140(94.59%)</td>
</tr>
<tr>
<td>non-antiplatelet</td>
<td>763(84.78%)</td>
<td>137(15.22%)</td>
<td>42(10.32%)</td>
<td>365(89.68%)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>0.090</td>
<td>0.090</td>
<td>3.197</td>
<td>3.197</td>
</tr>
<tr>
<td>P</td>
<td>0.765</td>
<td>0.765</td>
<td>0.074</td>
<td>0.074</td>
</tr>
</tbody>
</table>

Abbreviations: VKA, vitamin K anticoagulants; NOACs, Non-vitamin K antagonist oral anticoagulants; NCDP, National Centralized Drug Procurement.

### 2.4 Bleeding in patients before and After NCDP

As shown in Figure 3(A), 64 patients had hemorrhage events. There were 58 cases of bleeding before the NCDP policy, accounting for 1.88% of the total cases. There were 6 cases of bleeding after the NCDP policy, accounting for 0.66% of the total cases. The number of patients with hemorrhage events decreased significantly after the NCDP policy, and the difference was statistically significant. ($\chi^2=6.585$, $P=0.01$). (Detailed data are shown in Table 3).

### 2.5 Effect of NCDP on Patients with multiple hospitalizations

A total of 3986 patients were included in this study, 1,987 of them were hospitalized multiple times, of which 1,659 were hospitalized repeatedly before the NCDP policy and 328 were hospitalized after the NCDP policy. As can be seen from Figure 3(B), among the patients who were repeatedly hospitalized before the NCDP policy, 1,461 (88.07%) were high-risk patients (CHA2DS2-VASC score $\geq 2$). After the NCDP policy, there were 302 (92.07%) high-risk patients and 26 (7.93%) low-risk patients. There were significant differences in middle and low-risk patients before and after the NCDP policy ($\chi^2=4.398$, $P=0.036$). As can be seen from Figure 3(C), among the high-risk patients, 852 (58.32%) did not take oral anticoagulants, and 609 (41.68%) took oral anticoagulants before the NCDP policy. After the NCDP policy, 203 (67.22%) high-risk patients took oral anticoagulants and 99 (32.78%) patients without oral anticoagulants. There was a significant increase in oral anticoagulants in patients with high-risk AF after the NCDP policy, and the difference was statistically significant ($\chi^2=62.851$, $P<0.001$). As can be seen from Figure 3(D), 511 (83.91%) of the high-risk patients before the NCDP policy took VKA, and 98 (16.09%) of the patients taking NOACs. Among the
high-risk patients after the NCDP policy, 27 (13.30%) were treated with oral VKA, and 176 (87.70%) were treated with oral NOACs. The proportion of high-risk patients with oral NOACs increased significantly after the NCDP policy ($\chi^2=339.499$, $P<0.001$). (Detailed data are shown in Table 3).

Table 3. Bleeding and comparison of high-risk patients and drug use in patients before and after NCDP

<table>
<thead>
<tr>
<th>Group</th>
<th>All</th>
<th>Bleeding</th>
<th>No bleeding</th>
<th>Medium and low risk patients</th>
<th>High-risk patients</th>
<th>High-risk patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before NCDP</td>
<td>3081</td>
<td>58(1.88%)</td>
<td>3023(98.12%)</td>
<td>198(11.93%)</td>
<td>1461(88.07%)</td>
<td>852(58.32%)</td>
</tr>
<tr>
<td>After NCDP</td>
<td>905</td>
<td>6(0.66%)</td>
<td>899(99.34%)</td>
<td>26(7.93%)</td>
<td>302(92.07%)</td>
<td>99(32.78%)</td>
</tr>
<tr>
<td>$P$</td>
<td>0.010</td>
<td>0.010</td>
<td>0.036</td>
<td>0.036</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Abbreviations: VKA, vitamin K anticoagulants; NOACs, Non-vitamin K antagonist oral anticoagulants; NCDP, National Centralized Drug Procurement.

### 2.6 The impact of NCDP on re-hospitalization patients before and after the policy

1,987 of the 3,986 patients were hospitalized multiple times. 219 of the patients who was hospitalized before the NCDP policy hospitalized again after procurement. As shown in Figure 4, anticoagulant analysis was performed in 219 patients who were hospitalized before and after NCDP, 140 (63.93%) refused oral anticoagulants before the NCDP policy, which decreased to 88 (40.18%) after the NCDP policy, 79 (36.07%) voluntarily took anticoagulants before the NCDP policy, it increased to 131 (59.82%) after the NCDP policy. The anticoagulant rate increased significantly after the NCDP policy ($\chi^2=24.736$, $P<0.001$). Before the NCDP policy, 70 people (88.61%) took oral VKA, 9 (11.39%) took NOACs; but after NCDP, 25 people (19.08%)
took oral VKA, 106(80.92%) choose NOACs(according to the survey, 91 people chose NOACs because of the price reduction after the NCDP policy or other reasons). After the NCDP policy, the number of oral NOACs in 219 repeatedly hospitalized patients increased significantly(\(\chi^2=96.153, P<0.001\)).(Detailed data are shown in Table 4).

Figure 4. Analysis of anticoagulants(A) and NOACs(B) use in 219 patients hospitalized before and after NCDP.

Table 4. Analysis of drug use in 219 patients hospitalized before and after NCDP

<table>
<thead>
<tr>
<th>Group</th>
<th>No oral anticoagulant</th>
<th>Oral anticoagulation</th>
<th>VKA</th>
<th>NOACs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before NCDP</td>
<td>140(63.93%)</td>
<td>79(36.07%)</td>
<td>70(88.61%)</td>
<td>9(11.39%)</td>
</tr>
<tr>
<td>After NCDP</td>
<td>88(40.18%)</td>
<td>131(59.82%)</td>
<td>25(19.08%)</td>
<td>106(80.92%)</td>
</tr>
<tr>
<td>(\chi^2)</td>
<td>24.736</td>
<td>24.736</td>
<td>96.153</td>
<td>96.153</td>
</tr>
<tr>
<td>P</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Abbreviations: VKA, vitamin K anticoagulants; NOACs, Non-vitamin K antagonist oral anticoagulants; NCDP, National Centralized Drug Procurement.

2.7 Logistic univariate analysis of the factors affecting the change of anticoagulants in patients

As shown in Table 5, Whether the patient changes dressing or not has nothing to do with age, type of medical insurance, hospitalization cost and antiplatelet, the NCDP policy [OR=511.703, 95% CI(103.879,2520.618), \(P<0.001\)] is the only factor affecting the change of anticoagulants in patients.

Table 5 Factors affecting dressing change in patients with AF

<table>
<thead>
<tr>
<th>Group</th>
<th>Assignment</th>
<th>B</th>
<th>S.E</th>
<th>Wals</th>
<th>Df</th>
<th>Sig</th>
<th>EXP(B)</th>
<th>95% C.I of EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCDP</td>
<td>Relevant=1</td>
<td>6.238</td>
<td>0.814</td>
<td>58.789</td>
<td>1</td>
<td>0.000</td>
<td>511.703</td>
<td>103.879,2520.618</td>
</tr>
<tr>
<td></td>
<td>Irrelevant=0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male=1</td>
<td>0.297</td>
<td>0.629</td>
<td>0.222</td>
<td>1</td>
<td>0.637</td>
<td>1.345</td>
<td>0.392,4.614</td>
</tr>
<tr>
<td></td>
<td>Female=0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.027</td>
<td></td>
<td>0.031</td>
<td>0.780</td>
<td>1</td>
<td>0.377</td>
<td>1.027</td>
<td>0.967,1.063</td>
</tr>
<tr>
<td>Type of medical insurance</td>
<td>At one's own expense=1</td>
<td>-1.317</td>
<td>1.997</td>
<td>0.435</td>
<td>1</td>
<td>0.510</td>
<td>0.268</td>
<td>0.005,13.236</td>
</tr>
<tr>
<td></td>
<td>Medical insurance=0</td>
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In this study, 3,986 patients with non-valvular atrial fibrillation were diagnosed by retrospective analysis from January 1, 2017 to June 30, 2022. Their general condition, anticoagulant use, and hemorrhage events were compared before and after the NCDP policy.

In this study, it was found that the NCDP policy did not reduce the hospitalization expenses of patients. The average cost before the NCDP policy was 8,900.57 ± 9,023.02 CNY, and that after the NCDP policy was 9,829.99 ± 10,886.87 CNY. The cost after the NCDP policy was significantly higher than before the NCDP policy. Increasing literature shows that the reduction of drug prices itself does not necessarily lead to reducing drug expenditure, which is a typical "bypass effect" in drug policy [21-22].

Our research also found that, the proportion of patients who chose oral anticoagulants increased from 40.02% to 61.33%, and the proportion of oral NOACs among anticoagulants increased from 15.41% to 90.99% after NCDP reform. The proportion of oral anticoagulants and oral NOACs increased significantly after the NCDP policy ($\chi^2=71.183\cdot 920.129, P<0.001$). Barcellona’s research [23] confirms that inadequate anticoagulant control of VKA leads to increased bleeding complications. Compared with oral VKA, oral NOACs do not need to monitor INR, the frequency of follow-up is correspondingly reduced, and there are fewer side effects such as bleeding [24]. Based on the overall clinical benefits of NOAC, NOAC is more popular than VKA in preventing stroke in patients with atrial fibrillation, especially new-onset atrial fibrillation, according to the European guidelines (category I, evidence level A) [25]. According to the current ESC guidelines, for most patients, it is also based on the positive results of large outcome trials [26-29]. However, for patients in the county, especially in grass-roots areas, although NOAC has many advantages, the price of NOAC before the NCDP policy is too expensive for continuous drug compliance in patients, and some patients even refuse oral anticoagulation. After NOACs entered the procurement, the price and the burden of patients was significantly reduced, and patient compliance was improved. The proportion of oral anticoagulants and oral NOACs increased significantly after all NCDP.

The study found no effect on the choice of anticoagulant drugs before and after antiplatelet therapy before the NCDP policy. However, after NOACs entered the procurement, the number of atrial fibrillation patients with antiplatelet therapy taking NOACs increased significantly from 15.92% to 94.59%. Accordingly, the use of VKA decreased significantly. Patients with ACS in antiplatelet therapy, whether NCDP or not did not affect the use of anticoagulants, which may be related to the grass-roots doctors can strictly follow the guidelines, in addition, patients’ compliance is higher in our center. Previous studies have shown that combining VKA and double antiplatelet aggregation drugs can significantly increase patients’ bleeding risk [30]. International guidelines also recommend NOACs as the first choice for anticoagulation in treating atrial fibrillation complicated with coronary heart disease [31-32]. The guidelines for diagnosis and Management of 2020ECS/EACTS Atrial Fibrillation [33] recommend that if patients with atrial fibrillation complicated with ACS, CCS and/or PCI meet the conditions for the use of NOACs, NOACs are recommended for use in combination with antiplatelet aggregation drugs (I recommendation, class An evidence).
219 patients hospitalized before the NCDP policy were repeatedly hospitalized after the NCDP policy. According to statistics, the number of oral anticoagulants increased from 79 to 131 before procurement, and the number of patients without oral anticoagulants decreased from 140 to 88. Among the patients who were repeatedly hospitalized before and after the NCDP policy, the anticoagulant rate increased significantly after the NCDP policy, with a statistical difference ($\chi^2 = 24.736, P < 0.001$). Before the NCDP policy, 70 people chose to take oral VKA, after the NCDP policy, only 25 people took oral VKA, and people on oral NOACs increased to 106 (91 people chose NOACs voluntarily after the price had lowered). The utilization rate of NOACs increased significantly after procurement, and the difference was statistically significant ($\chi^2 = 96.153, P < 0.001$). NOAC is regarded as the first choice of anticoagulant drugs. It has been proved that the discontinuation rate of NOAC is much lower than VKA\cite{34-38}. After the policy intervention, the use of NOAC increased significantly, while the opposite was the case for VKA use. These results are consistent with the main body of the literature\cite{39-42}.

We found hemorrhage events decreased from 1.88% to 0.66% ($\chi^2 = 6.585, P = 0.01$). For grass-roots patients, taking VKA requires regular monitoring of blood coagulation function, and it is challenging to maintain INR at 2.0-3.0. In the outpatient (emergency) department, patients with atrial fibrillation often go to the doctor frequently for complications of organ bleeding caused by oral VKA and repeated bleeding, resulting in poor compliance with oral VKA. NOACs overcome the above shortcomings of VKA, making antithrombotics safer. After the NCDP policy, the drug price was reduced, the use of NOACs was significantly increased, and the oral anticoagulant rate and medication compliance of patients have been greatly improved. Studies\cite{43-45} have consistently shown that compared with VKA, NOAC causes less intracranial hemorrhage and less life-threatening bleeding. Patients with massive hemorrhage (especially extracranial hemorrhage) under NOAC have also proved to have a better prognosis than those treated with VKA.

Logistic univariate analysis was used to analyze the factors affecting the dressing change. Whether the patients change their dressing or not has nothing to do with age, type of medical insurance, hospitalization cost and antiplatelet since the NCDP policy is the only factor affecting dressing change. It may be that after the NCDP policy, the price of NOACs is reduced, and NOACs have the advantages of few side effects and no need to monitor INR, it was recommended by clinicians or people around them, so the number of people who choose oral NOACs increases significantly.

4. Limitations
The shortcomings of this study are only to study the drug use of inpatients in the cardiology department of the general hospital, the lack of data on non-valvular atrial fibrillation in outpatients and other departments, and the lack of drug use data in township hospitals.

5. Conclusions
The NCDP policy to be beneficial in improving the overall quality of medication in patients with atrial fibrillation, reducing the burden of patients with chronic diseases, improving patients’ compliance with medication, reducing hemorrhage events caused by oral anticoagulants, and improving the prognosis of patients.

Reference


