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MEDICATION USE, HEALTH CARE RESOURCE USE AND DIRECT MEDICAL COSTS FOR PATIENTS WITH VERY-HIGH-RISK ATHEROSCLEROTIC CARDIOVASCULAR DISEASE IN CHINA

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ABSTRACT

- **OBJECTIVES:** To investigate medication use, health care resource use and direct medical costs for patients with very-high-risk atherosclerotic cardiovascular disease (ASCVD) in China.
- **METHODS:** Data were obtained from Urban Employee Basic Medical Insurance database (2012-2017) in Tianjin, China. Very-high-risk ASCVD patients with medical history of 1 major ASCVD event combined with multiple high-risk conditions or history of multiple major ASCVD events were identified between 2014 and 2015, and followed for 24 months. Medication use including statins, antiplatelets, β-blockers, angiotensin-converting enzyme inhibitors/angiotensin receptor antagonists (ACEIs/ARBs) was investigated with each 3-month as an interval. All-cause health care resource utilization including hospitalizations and outpatient visits were estimated respectively, and all-cause direct medical costs were also calculated.
- **RESULTS:** 34740 patients with very-high-risk ASCVD were included (mean age: 67.1 years; 42.5% female), which accounted for 35.2% of clinical ASCVD patients. The medication use was suboptimal among included patients. The prescription percentages for antiplatelets, statins, ACEIs/ARBs, β-blockers in the first 3-month follow-up were 69.7%, 58.7%, 49.9% and 29.3% respectively, which gradually decreased in the following follow-up. In the first 12-month follow-up, 57.5% of patients experienced ≥1 hospitalization, with a mean (SD) length of stay of 13.1 (7.9) days and a mean cost of ¥17306.2 per admission. 99.1% of patients experienced ≥1 outpatient visit with a mean (SD) number of visits of 44.4 (39.2) and a mean cost of ¥277.8 per visit. The annual mean all-cause costs were ¥30564.5 per patient, in which medication cost accounted for 58.0%.
- **CONCLUSIONS:** Use of cardiovascular medications in very-high-risk ASCVD patients was poor in China, and their economic burden were considerable driven by the hospitalization cost. Efforts aiming to improve drug adherence among very-high-risk ASCVD patients may have the potential to reduce the use of inpatient services and lead to better economic outcomes.

BACKGROUND

- Atherosclerotic cardiovascular disease (ASCVD) includes coronary heart disease (CHD), stroke, and peripheral arterial disease, all of presumed atherosclerotic origin. [1]
- For ASCVD patients, the use of cardiovascular medications (statins, antiplatelets, β-blockers, angiotensin-converting enzyme inhibitors/angiotensin receptor antagonists (ACEIs/ARBs)) was usually poor, and their medical burden was heavy. [2-6]
- According to the 2018 AHA/ ACC/ AACVPR/ AAPA/ ABC/ ACPM/ ADA/ AGS/ APhA/ ASPC/ NLA/ PCNA Guideline on the Management of Blood Cholesterol, and Chinese expert consensus on lipid management of very high-risk atherosclerotic cardiovascular disease patients, clinical ASCVD can be divided into very high-risk ASCVD and ASCVD not at very high-risk. [1, 7]
- For patients with very-high-risk ASCVD, the use of cardiovascular medications and their medical burden was still unclear.

OBJECTIVES

- To investigate medication use, health care resource use and direct medical costs for patients with very high-risk ASCVD in China.

METHODS

Data source

- Data were obtained from the Tianjin Urban Employee Basic Medical Insurance database (UEBMI, 2012-2017).
- The database contains health care service and medication prescription claims of employees and retirees in Tianjin, representing about 5.54 million enrollees in 2017.
- The analytical sample in this study was a random sample of 30% of all enrollees.

Key definition

- Clinical ASCVD patients: Patients with myocardial infarction (MI), or stable or unstable angina, or ischemic stroke (IS), or peripheral arterial disease (PAD), or coronary other arterial revascularization.
- Very-high-risk ASCVD patients: Patients with medical history of 1 major ASCVD event combined with multiple high-risk conditions or history of multiple major ASCVD events.
  - Major ASCVD event: Recent unstable angina (UA, within the past 12 months); MI; IS; PAD.
  - High-risk conditions: Age ≥ 65 years; History of prior coronary artery bypass surgery or percutaneous coronary intervention outside of the major ASCVD event; Diabetes mellitus; Hypertension; Heart failure; Chronic kidney disease (CKD, stage V).

Study period

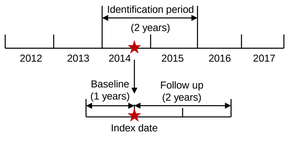

Figure 1. Study time design

Study population

- Adult patients (≥18 years)
- Patients who meet any of the following 3 conditions (Table 1) in 2014-2015:
- Patients who continually enrolled during the baseline and follow up period.

Table 1. Ways to identify very-high-risk ASCVD patients

	Very-high-risk ASCVD patients	Index event
1	Patients who had major ASCVD events within 2 years before the index date (date of index event)	First major ASCVD event in identification period
2	Patients who had ≥ 2 high-risk conditions within 2 years before the index data	First major ASCVD event in identification period
3	Patients who didn't have ≥ 2 high-risk conditions or major ASCVD event within 2 years before the first major ASCVD event in identification period, but had ≥ 2 major ASCVD events in identification period	Second major ASCVD event in identification period

Measures:

- Proportion of very-high-risk ASCVD patients in clinical ASCVD patients.
- Baseline characteristics of very-high-risk ASCVD patients.
  - Demographics, medical history, medication history, and baseline health care resource use.
- Medication use of very-high-risk ASCVD patients.
  - Statins, antiplatelets, β-blockers, angiotensin-converting enzyme inhibitors/ angiotensin receptor antagonists (ACEIs/ARBs) .
- Economic burden of very-high-risk ASCVD patients.[1]
  - Health care resource use.
  - Direct medical costs.

1. Only show the results in the first follow up year.

RESULTS

Baseline characteristics (Table 2)

- 34740 patients with very-high-risk ASCVD were included, which accounted for 35.2% of clinical ASCVD patients.
  - Mean age: 67.1 ±11.0 years.
  - Female: 42.5%.

Table 2. Baseline characteristics of very-high-risk ASCVD patients

Baseline characteristics	Very-high-risk ASCVD patients (N=34740)	
Demographic characteristics		
Mean age, mean (SD)	67.1	11.0
Age group, n (%)		
(-, 45]	1050	3.0%
(45, 55]	3871	11.1%
(55, 65]	10301	29.7%
(65, 75]	10931	31.5%
(75, +)	8587	24.7%
Female, n (%)	14752	42.5%
Index event, n (%)		
MI	1534	4.4%
UA	11450	33.0%
IS	17489	50.3%
PAD	4267	12.3%
CCI, mean (SD)	2.6	2.1
Medical history, n (%)		
Hypertension	27788	80.0%
Dyslipidemia	18801	54.1%
Diabetes mellitus	15595	44.9%
Heart failure	1830	5.3%
CKD (stage V)	180	0.5%
Medication history, n (%)		
Statins	14150	40.7%
Antiplatelets	18543	53.4%
β-blockers	11417	32.9%
AECIs/ARBs	18318	52.7%
All-cause resource utilization and cost		
Total direct medical cost, mean (SD)	21069.8	26051.6
Any hospitalizations，n(%)	18459	53.1%
Number of outpatient visits, mean (SD)	29.6	35.1

Abbreviations: SD, standard deviation; MI, myocardial infarction; UA, unstable angina; IS, ischemic stroke; PAD, peripheral arterial disease; CCI, Charlson Comorbidity Index; AECIs/ARBs, angiotensin-converting enzyme inhibitors/angiotensin receptor antagonists.

Medication use (Figure 2-3)

- In the first 3-month follow-up, there were 69.7%, 58.7%, 49.9% and 29.3% patients who had used antiplatelets, statins, ACEIs/ARBs, β-blockers, respectively.
- Only 13.3% patients had used these 4 cardiovascular medications in the first 3-month follow-up.
- These percentages decreased gradually in the follow up period.

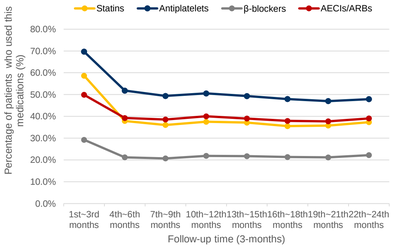

Figure 2. Percentage of patients who had used one of the 4 medications in very-high-risk ASCVD patients in 24-month follow-up

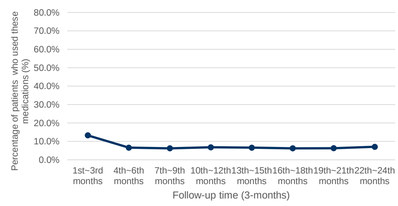

Figure 3. Percentage of patients who had used 4 medications in very-high-risk ASCVD patients in 24-month follow-up

Health care resource use (Figure 4)

- For hospitalized patients, 57.5% of them experienced ≥1 hospitalization in the first 12-month follow up year, with a mean ± SD length of stay of 13.1 ± 7.9 days and a mean ± SD number of hospitalizations of 1.9 ± 1.3.
- The mean number of outpatient visits was 44.4 ± 39.2 for outpatients in this year.

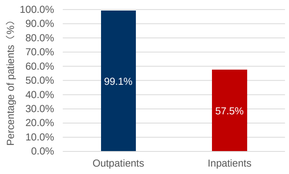

Figure 4. Percentage of outpatients and inpatients of very-high-risk ASCVD patients in first 12-month follow-up

Direct medical cost (Figure 5-7)

- For 34740 very-high-risk ASCVD patients, the mean ± SD value of total direct medical cost in the first follow up year was CNY 30564.5 ± 37925.1, with median as CNY 18097.5 and first quartile as CNY 6429.1.

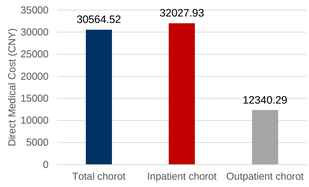

Figure 5. Mean annual direct medical cost of very-high-risk ASCVD patients in first 12-month follow-up

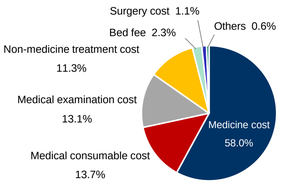

Figure 6. Cost structure of the total direct medical cost in the first follow up year

- For hospitalized patients, the mean ± SD value of total direct inpatient medical cost was CNY 32027.9 ± 38988.0.
- For outpatients, the mean ± SD value of total direct outpatients medical cost was CNY 277.8 ± 333.9.

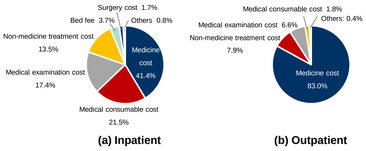

Figure 7. Cost structure of the total direct inpatient and outpatient medical cost in the first follow up year

LIMITATIONS

- First, the analyses were based on UEBMI database that covered employees and retirees in Tianjin, and the rest of Tianjin residents including unemployed people, young children and students were covered by the other public basic medical insurance. Therefore, the results of this study might not be representative enough for all populations in China.
- Second, medication use condition was estimated based on the prescriptions, but whether the patient actually took the medicine was uncertain, which may bias the related results.

CONCLUSIONS

- **More than one third of patients with clinical ASCVD are under very high-risk in China.**
- **Use of cardiovascular medications in very-high-risk ASCVD patients was poor in China, and their medical burden were considerable driven by the hospitalization cost.**
- **Efforts aiming to improve drug adherence among very-high-risk ASCVD patients may have the potential to reduce the use of inpatient services and lead to better economic outcomes.**

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