Supplemental material

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**Supplemental file 1**

**Table S1. Demographic characteristics of pharmacists in the pilot study.**

| Characteristics | Pharmacists N=20 |
|---|---|
| **Age(y)** | |
| 20-29 | 3 |
| 30-39 | 5 |
| 40-49 | 5 |
| 50-59 | 4 |
| ≥60 | 3 |
| **Gender** | |
| Male | 7 |
| Female | 13 |
| **Terminal degree** | |
| PhD | 3 |
| Master | 9 |
| Bachelor | 6 |
| Others | 2 |
| **Professional title** | |
| Chief pharmacist | 3 |
| Associate chief pharmacist | 4 |
| Pharmacist in charge | 6 |
| Pharmacist | 5 |
| No title (e.g. Intern) | 1 |
| others | 1 |
| **Years of experience** | |
| Less than 5 | 5 |
| 6-10 | 5 |
| 11-20 | 6 |
| 21-30 | 3 |
| More than 30 | 1 |

**Table S2. Data of the pilot study.**

| | |
|---|---|
| Total score of knowledge (Mean ± SD) | 3.85 ± 1.04 |
| Total score of perceptions (Mean ± SD) | 40.2 ± 5.16 |
| Cronbach's alpha value for perceptions | 0.732 |

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**Supplemental file 2**

## Knowledge, Perceptions and Practices of Pharmacists Regarding Generic Drugs in China

**Part I: Demographic characteristics**

1. What is your occupation?

   A. Pharmacist

   B. Other: _____

2. Which of the following range does your age fall in?

   A. 20-29 years old

   B. 30-39 years old

   C. 40-49 years old

   D. 50-59 years old

   E. Over 60 years old

3. What is your gender?

   A. Male

   B. Female

4. What is your terminal education degree?

   A. PhD

   B. Master degree

   C. Bachelor degree

   D. Others

5. What is your secondary department?

   A. Outpatient pharmacy

   B. Inpatient pharmacy

   C. Emergency Pharmacy

   C. Pharmacy storage

   D. Clinical pharmacy

   E. Compounding room

   F. Drug clinical trial institution / laboratory

   G. Other:_____

6. What is your professional title?

   A. Chief pharmacist

   B. Associate chief pharmacist

   C. Pharmacist in charge

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D. Pharmacist

E. No title (e.g. Intern)

F. Other: _____

7. By the end of March 2020, how many years have you worked as a pharmacist?

A. Less than 5 years

B. 6-10 years

C. 11-20 years

D. 21-30 years

E. Over 30 years

8. Where are you from?

City _____, Province _____

9. What is the level of your medical institution?

A. Tertiary hospital

B. Secondary hospital

C. Community hospital

D. Primary healthcare institutions (including community health service center, township health center, village health office, clinics)

**Part II: Knowledge of generic drugs**

10. Were you aware that China carries out the program of quality and efficacy consistency evaluation of generic drugs? (hereinafter referred to as "Consistency Evaluation")?

A. Yes

B. No

C. Unsure

11. Were you aware of the logo "Have passed the Consistency Evaluation" on the generic products?

A. Yes

B. No

C. Unsure

12. For the standard criteria of bioequivalence, please judge whether the following statements are correct or not.

*In principle, the method of bioequivalence tests in vivo is used for Consistency Evaluation. The standard of bioequivalence is that the 90% confidence interval of the geometric mean experiment/ reference ratios for main pharmacokinetic parameters*

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*(Cmax and AUC) falls entirely within the range of 90.00% ~ 120.00%.*

  A. True

  B. False

  C. Unsure

13. Were you aware that all the generic drugs in national centralized procurement have passed the consistency evaluation of quality and efficacy?

  A. Yes

  B. No

  C. Unsure

14. Please judge whether the following statement is correct or not.

  *The generic drugs in the national centralized procurement have the same active ingredients, dosage forms, routes of administration and therapeutic effects with the brand drugs.*

  A. True

  B. False

  C. Unsure

**Part III: Perceptions of generic substitution**

15. Generic drugs that have passed the consistency evaluation are as effective as brand-name equivalents.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

16. Generic drugs that have passed the consistency evaluation are as safe as brand-name equivalents.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

17. Generic drugs that have passed the consistency evaluation are less expensive than brand-name equivalents.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

18. Generic drugs that have passed the consistency evaluation are interchangeable with brand-name drugs.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

19. Replacing brand-name drugs with generic drugs that passed the consistency evaluation may change the clinical outcomes of medication treatment.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

20. Application of generic drugs that passed the consistency evaluation could improve

adherence to medication treatment of patients.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

21. Health providers need to explain detailed information about generic drugs to patients in order to ensure that they correctly understand and use generic drugs.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

22. Generic drugs can be exempted from clinical trials for approval if they passed bioequivalence trials in vivo.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

23. Relevant organizations should formulate and issue standard guidelines for generic substitution.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

24. I support the current policy of substituting brand-name drugs with generic drugs that have passed the consistency evaluation.

☐Strongly agree ☐Agree ☐Neutral ☐Disagree ☐Strongly disagree

**Part IV: Practices of generic substitution**

25. How has the amount of generic drugs used in your medical institution changed after the implementation of national centralized procurement of drugs?

    A. Significantly increased

    B. Increased somewhat

    C. Basically unchanged

    D. Decreased

    E. Unsure

26. What factors do you think affect the selection of generic drugs? Please select the top 3 important items.

    ☐ National policies and hospital regulations

    ☐ Efficacy of generic drugs

    ☐ Safety of generic drugs

    ☐ Economy of generic drugs

    ☐ Accessibility of generic drugs and brand-name drugs

    ☐ Physicians clinical expertise in medication treatment

    ☐ Patients financial burden

    ☐ Patients willingness and preferences

    ☐ Promotion of drug representatives

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☐ Reputation of generic drugs manufacturers

☐ Other:_____

27. What factors do you think affect patients' choice of selecting generic drugs in the national centralized procurement? Please select the top 3 important items.

☐ Patients preference for brand-name drugs and medication habits

☐ Efficacy of generic drugs

☐ Safety of generic drugs

☐ Out-of-pockets cost of drugs

☐ Patients financial burden

☐ Physicians suggestion s

☐ National policies

☐ Other:_____

28. What do you think is the largest challenge in implementing the national centralized procurement and use of generic drugs? Please select the top 3 important items.

☐ There is no enough time to explain details to patients.

☐ It is difficult to change patients preference.

☐ Lack of trust in the efficacy and safety of generic drugs.

☐ There is an increased risk of errors in dispensing drugs.

☐ There is an increased cost in maintenance and manpower.

☐ Other:_____

29. What measures should be taken to promote the national centralized procurement and use of generic drugs? Please select the top 3 important items.

☐ Encourage patients to use generic drugs by use of health insurance policies.

☐ Increase publicity of centralized procurement policies.

☐ Educate health providers on centralized procurement policies and information about selected drugs.

☐ Medical institutions should restrict the use of the brand-name drugs with the same generic name, and retain only the selected generic drugs.

☐ Medical institutions should restrict the use of all brand-name drugs with the same pharmacological action.

☐ Standard guidelines on generic substitution should be issued.

☐ Other:_____

That's all. Thank you very much for the participation!

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**Supplemental file 3.**

**Table S3 Association between pharmacists' knowledge and demographic characteristics.**

| Statement | Yes or Correct response N (%) | No or Incorrect response N (%) | Unsure N (%) | Age (P-value)[*] | Terminal Degree (P-value)[*] | Years of experience (P-value)[*] | Professional title (P-value)[*] | Gender (P-value)[†] | Location (P-value)[†] | Medical Institution (P-value)[†] |
|---|---|---|---|---|---|---|---|---|---|---|
| Were you aware that China carries out the program of quality and efficacy consistency evaluation of generic drugs? | 2118 (92.4) | 74 (3.2) | 99 (4.3) | 0.142 | **0.000** | 0.447 | **0.000** | 0.155 | **0.026** | 0.794 |
| Were you aware of the logo "Have passed the Consistency Evaluation" on the generic products? | 1718 (75.0) | 320 (14.0) | 253 (11.0) | **0.010** | 0.129 | 0.070 | 0.068 | **0.020** | **0.000** | 0.450 |
| True/False: In principle, the method of bioequivalence tests in vivo is used for Consistency Evaluation. The standard of bioequivalence is that the 90% confidence interval of the geometric mean experiment/ | 225 (9.8) | 1666 (72.7) | 400 (17.5) | 0.052 | 0.164 | 0.734 | 0.096 | 0.251 | **0.000** | 0.254 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| reference ratios for main pharmacokinetic parameters (Cmax and AUC) falls entirely within the range of 90.00% ~ 120.00%. | | | | | | | | | | |
| Were you aware that all the generic drugs in national centralized procurement have passed the consistency evaluation of quality and efficacy? | 2067 (90.2) | 68 (3.0) | 156 (6.8) | 0.094 | 0.153 | 0.076 | **0.001** | 0.097 | **0.003** | 0.449 |
| True/False: The generic drugs in the national centralized procurement have the same active ingredients, dosage forms, routes of administration and therapeutic effects with the brand drugs. | 2078 (90.7) | 57 (2.5) | 156 (6.8) | 0.338 | 0.104 | 0.467 | **0.046** | 0.213 | **0.047** | 0.108 |

Bold *P*-values represent statistical significance.

\* P-value calculated using Kruskal-Wallis test.

† P-value calculated using Chi-square.

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**Table S4 Association between pharmacists' perceptions and demographic characteristics.**

| Statement | Strongly Agree N (%) | Agree N (%) | Neutral N (%) | Disagree N (%) | Strongly Disagree N (%) | Agree (P-value) * | Gender (P-value) † | Terminal Degree (P-value) * | Years of experience (P-value) * | Location (P-value) * | Professional title (P-value) * | Medical institution (P-value) * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Generic drugs that have passed the consistency evaluation are as effective as brand-name equivalents. | 361 (15.8) | 1179 (51.5) | 684 (29.9) | 58 (2.5) | 9 (0.4) | 0.752 | **0.000** | **0.000** | 0.400 | **0.001** | **0.004** | 0.582 |
| Generic drugs that have passed the consistency evaluation are as safe as brand-name equivalents. | 355 (15.5) | 1226 (53.5) | 657 (28.7) | 50 (2.2) | 3 (0.1) | 0.572 | **0.001** | **0.000** | 0.441 | 0.269 | **0.016** | 0.554 |
| Generic drugs that have passed the consistency evaluation are less expensive than brand-name equivalents. | 1076 (47.0) | 987 (43.1) | 218 (9.5) | 10 (0.4) | 0 (0.0) | 0.312 | **0.030** | **0.000** | 0.464 | 0.108 | 0.131 | 0.099 |
| Generic drugs that have passed the consistency evaluation are interchangeable with brand-name drugs. | 314 (13.7) | 1085 (47.4) | 784 (34.2) | 96 (4.2) | 12 (0.5) | 0.074 | **0.000** | **0.000** | 0.050 | **0.000** | 0.188 | 0.131 |
| Replacing brand-name drugs with generic drugs that passed the consistency evaluation may change the clinical outcomes of | 53 (2.3) | 387 (16.9) | 1047 (45.7) | 615 (26.8) | 189 (8.2) | **0.000** | **0.002** | 0.062 | **0.001** | **0.000** | **0.000** | 0.190 |

medication treatment.*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Application of generic drugs that passed the consistency evaluation could improve adherence to medication treatment of patients. | 228 (10.0) | 873 (38.1) | 1005 (43.9) | 169 (7.4) | 16 (0.7) | 0.029 | **0.022** | **0.002** | **0.037** | **0.042** | **0.003** | 0.204 |
| Health providers need to explain detailed information about generic drugs to patients in order to ensure that they correctly understand and use generic drugs. | 640 (27.9) | 1369 (59.8) | 258 (11.3) | 20 (0.9) | 4 (0.2) | 0.415 | **0.033** | **0.028** | 0.167 | 0.143 | 0.119 | 0.151 |
| Generic drugs can be exempted from clinical trials for approval if they passed bioequivalence trials in vivo. | 191 (8.3) | 510 (22.3) | 759 (33.1) | 673 (29.4) | 158 (6.9) | 0.075 | **0.024** | **0.001** | 0.128 | **0.002** | 0.593 | **0.034** |
| Relevant organizations should formulate and issue standard guidelines for generic substitution. | 661 (28.9) | 1312 (57.3) | 296 (12.9) | 20 (0.9) | 2 (0.1) | 0.503 | 0.051 | **0.000** | 0.415 | **0.033** | **0.005** | 0.217 |
| I support the current policy of substituting brand-name drugs with generic drugs that have passed the consistency evaluation. | 409 (17.9) | 1225 (53.5) | 619 (27.0) | 32 (1.4) | 6 (0.3) | 0.135 | **0.000** | 0.051 | 0.410 | **0.000** | 0.662 | **0.026** |

Bold *P*-values represent statistical significance.

*P-value calculated using Kruskal-Wallis test.

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† P-value calculated using Mann-Whitney U test.

**Table S5 Crosstabs between support for generic substitution and locations.**

| N (%) | Beijing | Tianjin | Shanghai | Chongqing | Shenyang | Dalian | Xiamen | Guangzhou | Shenzhen | Chengdu | Xi-an | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Agreed** | 423 (76.8%) | 147 (77.4%) | 95 (53.3%) | 66 (64.7%) | 127 (67.9%) | 189 (72.4%) | 71 (78.9%) | 104 (65.4%) | 191 (72.9%) | 71 (71.7%) | 150 (70.7%) | 1634 (71.3%) |
| **Neutral** | 118 (21.4%) | 43 (22.6%) | 76 (42.7%) | 34 (33.3%) | 55 (29.4%) | 70 (26.8%) | 18 (20.0%) | 52 (32.7%) | 66 (25.2%) | 26 (26.3%) | 61 (28.8%) | 619 (27.0%) |
| **Disagreed** | 10 (1.8%) | 0 (0.0%) | 7 (4.0%) | 2 (2.0%) | 5 (2.7%) | 2 (0.8%) | 1 (1.1%) | 3 (1.9%) | 5 (1.9%) | 2 (2.0%) | 1 (0.5%) | 38 (1.7%) |
| **Total** | 551 (100.0%) | 190 (100.0%) | 178 (100.0%) | 102 (100.0%) | 187 (100.0%) | 261 (100.0%) | 90 (100.0%) | 159 (100.0%) | 262 (100.0%) | 99 (100.0%) | 212 (100.0%) | 2291 (100.0%) |