Evaluation of Need and Distribution of National Essential Medicines List in Village Clinics: A Cross-sectional Study Based on the Perspective of Village Doctors in China*

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Summary: This study aimed to evaluate the satisfaction of village doctors to essential medicines list (EML) and accessibility of essential medicines (EMs) distribution to improve the implementation of EML in village clinics. A total of 422 village doctors from five counties in three provinces of China were surveyed by questionnaires. Logistic regression analysis was conducted to identify the main factors associated with village doctors' evaluation of EML. The results showed that village doctors had a negative evaluation in satisfaction level of EML to village-based care and accessibility of EM distribution. The government should adjust EML regularly based on the actual health status of local villagers in China and focus on adding appropriate drugs that meet the needs of villagers with chronic disease. The local government should also attach importance to the distribution of EMs and maintain their supply in village clinics.
Key words: essential medicines list; village doctor; need; distribution; China

The World Health Organization (WHO) published the first essential medicines list (EML) in 1977; the list helped establish the principle that some medicines are more useful than others and that essential medicines are often inaccessible to many populations[1]. In 2001, revised edition of the list has been published and 156 WHO member states have adopted the EML[2]. At present, the majority of developed and developing countries have published EMLs that meet the health status of residents, and national EML was guided by the WHO. The national EML has reduced drug costs, standardised rational use of drugs and promoted the health of residents. The cost of drugs has dropped by 75% to 95% in Brazil[3]. The Russian government implemented the drug compensation program to help outpatients with out-patient drugs to decrease medicines expenditure[4]. India began to implement national EML to address drug shortages, control drug costs and solve the problem of abuse of expensive drugs. Most of nations improved the availability of drugs by selecting EML and enforcing use of essential medicines (EMs)[5].

The Chinese government announced in 2009 a systematic plan to achieve universal access to health care by 2020. One of the key pillars of the plan is the establishment of national essential medicines policy (NEMP) to ensure drug safety, quality, supply and affordability[6]. In the same year, the first edition of *the National Essential Medicines List* was issued and contains 307 EMs (including 205 Western medicines and 102 Chinese medicines)[7]. Moreover, provincial governments should be allowed to develop provincial supplementary EMLs on the basis of the national EML[8]. In addition, a key policy element of the NEMP is a zero mark-up policy under which EMs are sold to patients for procurement price plus a fixed distribution cost without profit to the selling health facility[9]. In 2012, the Chinese government issued the second edition of *the National Essential Medicines List*, which covers 520 EMs (including 317 Western medicines and 203 Chinese traditional medicines)[10]. However, drugs in the EML still cannot satisfy the needs of villagers; as such, the list must be further improved. After the implementation of the zero mark-up policy, the economic burden of villagers was reduced to a certain extent[11]. Given that supporting policies have not been

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established, problems such as irrational use of drugs[12], declining income of village doctors[13] and lack of timely distribution of EM have been encountered[14].

In rural China, village clinics are the bottom of the three-tier health care network. Village doctors provide basic medical treatment and public health services in village clinics[15]. As the provider of the NEMP in village clinics, evaluation of EML by rural doctors can reflect the condition of implementing the NEMP in the rural areas of China[16]. At present, the research on NEMP in China mainly focuses on rational drug use and drug cost in medical institutions, and lacks accessibility and distribution evaluation of the essential drug policy from the perspective of village doctors. This study aimed to investigate the satisfaction level of village doctors towards EML for village-based care and accessibility of EM distribution. Results provide policy advice for implementation of the NEMP in village clinics.

1 METHODS

1.1 Study Area

In this study, multi-stage stratified cluster sampling was used. Three provinces (Zhejiang, Hubei and Gansu) representing contexts with varying levels of socioeconomic status (SES) were selected as study areas. Zhejiang is located in Eastern China and represents the developed parts of China. Hubei is part of the central region of China and an example of a moderately developed region. Gansu is located in the northwest part of China and considered an undeveloped region. At the end of 2014, the NEMP covered all village clinics in the three provinces. In each province, 1–2 counties with moderately developed level were selected and in each county, 3–5 townships with more village clinics were selected. In each village clinic, one village doctor was interviewed. At last, 422 rural doctors from 19 townships in 5 counties were surveyed.

1.2 Questionnaire Survey

A questionnaire was designed based on a large number of domestic and foreign literatures and consulting experts. The three following aspects were investigated: (1) basic situation including sex, age, education, vocational qualification, professional title and monthly income of village doctor; (2) assessment of EML including the familiarity, satisfaction and requirement of EML; (3) evaluation of EM distribution to village clinics.

From June to August 2014, the research team conducted a field investigation one by one in 19 townships. The questionnaires were distributed to village doctors and self-administered questionnaire were used to complete the survey. Each questionnaire was answered within 10 min. After being checked by the inspector, the questionnaires were recovered on the spot.

1.3 Data Analysis

The quantitative data were subjected to unified coding and strict logical examination and double entered into a database. SPSS 22.0 was employed to run all statistical analysis. P value <0.05 was considered statistically significant. Initial descriptive analysis summarized village doctors' social demographic characteristics and presented the corresponding frequencies and proportions. The Fisher exact probability method was used to compare differences among the three provinces. Univariate and multivariate analyses were performed by binary logistic regression method to identify the main factors associated with village doctors' identification of EML. Crude and adjusted OR values with 95% CIs were reported.

1.4 Ethics Approval

The study was approved by the Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (No. 201306). All of the participants gave their informed consent prior to the study.

2 RESULTS

2.1 Characteristics of Village Doctors

In the research, 422 village doctors were interviewed with an effective survey response rate of 93.8%. As shown in table 1, the majority of the participants in this survey were male (78.7%). The largest age group comprised participants aged 50–59 years (34.1%) followed by those aged 40–49 years (27.5%). 32.2% and 43.6% of village doctors' monthly income was 2000–3000 and 1000–1999 yuan, respectively. Most respondents had low educational levels and professional titles. About 80.6% of the participants finished secondary school, and 56.9% had no title. A total of 80.6% of the respondents had rural doctor qualification.

2.2 Need Evaluation of EML

As shown in table 2, 63.5% of village doctors indicated that they were relatively familiar with *the National Essential Medicines List* (edition 2012). About 48.6% of the respondents had a neutral attitude towards drugs in the EML. Moreover, 50.9% of the respondents believed that the EML could not meet the needs of villagers. A total of 47.6% and 50.0% of the respondents held neutral attitudes towards EML to meet the needs of hypertensive and diabetic patients. In addition, 61.1% of the respondents believed that the EML could not meet the needs of children with upper respiratory tract infection. As shown in table 3, village doctors generally believes that basic drug catalogues need to be supplemented by drugs in paediatrics, gynaecology and dermatology, and 81.0%, 59.9% and 60.1% village doctors supported this view, respectively.

Table 1 Characteristics of village doctors included in this study

Characteristics	Hubei		Zhejiang		Gansu		Total	
	n	%	*n*	%	*n*	%	*n*	%
Sex								
Male	235	78.9	30	73.2	67	80.7	332	78.7
Female	63	21.1	11	26.8	16	19.3	90	21.3
Age (years old)								
19–39	43	14.4	5	12.2	38	45.7	86	20.4
40–49	70	23.5	11	26.8	35	42.2	116	27.5
50–59	121	40.6	13	31.7	10	12.0	144	34.1
60–78	64	21.5	12	29.3	0	0	76	18.0
Education								
Secondary vocational school	248	83.2	28	68.3	64	77.1	340	80.6
Junior college	31	10.4	11	26.8	16	19.3	58	13.7
Undergraduate	0	0	1	2.4	3	3.6	4	0.9
None	19	6.4	1	2.4	0	0	20	4.7
Qualification								
Certified doctor	19	6.4	4	9.8	2	2.4	25	5.9
Certified assistant	31	10.4	11	26.8	6	7.2	48	11.4
Certified rural doctor	246	82.6	26	63.4	68	81.9	340	80.6
Disqualified	2	0.7	0	0	7	8.4	9	2.1
Technical title								
Primary	105	35.2	16	39.1	56	67.4	177	41.9
Intermediate	3	1.0	1	2.4	1	1.2	5	1.2
None	190	63.8	24	58.5	26	31.3	240	56.9
Monthly income (RMB, yuan)								
<1000	12	4.0	1	2.4	53	63.9	66	15.6
1000–1999	92	30.9	27	65.9	17	20.5	136	32.2
2000–2999	163	54.7	10	24.4	11	13.3	184	43.6
>3000	31	10.4	3	7.3	2	2.4	36	8.5

Table 2 Village doctors' evaluation of EML

Indicator	Hubei		Zhejiang		Gansu		Total		*P*
	n	%	*n*	%	*n*	%	*n*	%	
Village doctors' knowledge of EML									
Familiar	202	67.8	22	53.6	44	53.0	268	63.5	0.00**
Average	92	30.9	14	34.1	27	32.5	133	31.5	
Unfamiliar	4	1.3	5	12.2	12	14.5	21	5.0	
Do you agree with the medicines contained in the EML?									
Agree	106	35.6	17	41.5	32	38.6	155	36.7	0.856
Neutral	148	49.7	19	46.3	38	45.8	205	48.6	
Disagree	44	14.8	5	12.2	13	15.7	62	14.7	
Can the drugs in the EML meet the needs of the villagers?									
Yes	32	10.7	9	22.0	9	10.8	50	11.8	0.187
Neutral	107	35.9	16	39.0	34	41.0	157	37.2	
No	159	53.4	16	39.0	40	48.2	215	50.9	
Can the drugs in the EML meet the needs of hypertensive patients?									
Yes	72	24.2	14	34.1	17	20.5	103	24.4	0.00**
Neutral	153	51.3	19	46.3	29	34.9	201	47.6	
No	73	24.5	8	19.5	37	44.6	118	28.0	
Can the drugs in the EML meet the needs of diabetic patients?									
Yes	41	13.8	11	26.8	16	19.3	68	16.1	0.032*
Neutral	161	54.0	20	48.8	30	36.1	211	50.0	
No	96	32.2	10	24.4	37	44.6	143	33.9	
Can the drugs in the EML meet the needs of Children with upper respiratory tract infection?									
Yes	16	5.4	4	9.8	16	19.3	36	8.5	0.00**
Neutral	84	28.2	13	31.7	31	37.3	128	30.3	
No	198	66.4	24	58.5	36	43.4	258	61.1	

*P<0.05, **P<0.01

2.3 Evaluation of Distribution of Essential Medicines

For village doctors' evaluation of distribution of EMs, 44.1% of the respondents had a neutral attitude towards local pharmaceutical distribution companies selected by the local governments, 44.8% of the respondents supported the distribution of EM by township hospitals and 51.4% of the participants believed that the EML could not meet the requirements of village clinics (table 4). For village doctors' evaluation of distribution approaches, 73.0% of the respondents indicated that village clinics often lacked EM, 53.6% of respondents had a neutral attitude towards the timeliness of EM delivery and 71.1% of the village doctors believed that the distribution price of EM was high.

2.4 Influencing Factors of Village Doctors' Attitudes towards EML

We conducted a study on village doctors' attitudes towards EMLs as dependent variables. The dependent variables included basic situation of village doctor, change in income before and after the introduction of EML, suitability of EML to the village clinic, familiarity with EML, satisfaction of EML to basic medical needs and satisfaction of EML to hypertension and diabetes. Univariate and multivariate analyses showed suitability of EML for the village clinics (OR=5.598, 95%CI 3.336–9.393) and satisfaction of the list to basic medical needs (OR=2.829, 95%CI 1.706–4.694) were the influencing factors of village doctors' attitudes towards EML (table 5).

3 DISCUSSION

3.1 EML Cannot Meet the Needs of Village-based Care

Economic development and distribution of health resources greatly differ among the rural areas of Zhejiang, Hubei and Gansu. Therefore, implementation

Table 3 Village doctors' belief regarding the types of drugs that should be supplemented

The types of drugs	Hubei		Zhejiang		Gansu		Total		*P*
	n	%	*n*	%	*n*	%	*n*	%	
Antibacterial	103	34.7	10	24.4	48	57.8	161	38.2	0.00**
Paediatric drugs	246	82.8	32	78.0	63	75.9	341	81.0	0.32
Gynaecologic medicines	177	59.6	14	34.1	61	73.5	252	59.9	0.00**
Dermatologic medicines	190	64.0	22	53.7	41	49.4	253	60.1	0.038*
Others	27	9.1	3	7.3	17	20.5	47	11.2	0.001**

*P<0.05, **P<0.01

Table 4 Village doctors' attitudes towards distribution agencies and processes

Indicator	Hubei		Zhejiang		Gansu		Total		*P*
	No.	%	No.	%	No.	%	No.	%	
Do you approve of pharmaceutical distribution company selected by government?									
Yes	117	39.3	20	48.8	53	63.9	190	45.0	0.001**
Neutral	144	48.3	17	41.5	25	30.1	186	44.1	
No	37	12.4	4	9.8	5	6.0	46	10.9	
Can you accept the distribution of basic medicine from the township health center?									
Yes	131	44.0	19	46.3	39	47.0	189	44.8	0.032*
Neutral	127	42.6	17	41.5	23	27.7	167	39.6	
No	40	13.4	5	12.2	21	25.3	66	15.6	
Is it necessary for the village clinic to store all the drugs in the EML?									
Yes	73	24.5	6	14.6	27	32.5	106	25.1	0.019*
Neutral	68	22.5	17	41.5	14	16.9	99	23.5	
No	157	52.7	18	43.9	42	50.6	217	51.4	
Is there a shortage of drugs in the village clinic?									
Often	236	79.2	22	53.7	50	60.2	308	73.0	0.00**
Seldom	60	20.1	18	43.9	31	37.3	109	25.8	
Never	2	0.7	1	2.4	2	2.4	5	1.2	
Is the essential medicine of the village clinic distributed in time?									
Timely	21	7.0	15	36.6	19	22.9	55	13.0	0.00**
Neutral	159	53.4	19	46.3	71	85.5	226	53.6	
Delay	118	39.6	7	17.1	16	19.3	141	33.4	
What do you think of the price of EMs distribution?									
High	213	71.5	16	46.3	71	85.5	300	71.1	0.00**
Medium	84	28.2	24	58.5	12	14.5	120	28.4	
Low	1	0.3	1	2.4	0	0	2	0.5	

*P<0.05, **P<0.01

Table 5 Influencing factors of village doctors' attitudes towards EML

Independent variable	Univariate analysis		Multivariate analysis	
	P	Crude OR (95%CI)	*P*	Adjusted OR (95%CI)
Change of income before and after the introduction of EML (Reference=Reduced)				
Unchanged	0.027*	1.609 (1.055, 2.453)	0.977	1.007 (0.592, 1.715)
Increased	0.474	1.44 (0.53, 3.912)	0.116	0.391 (0.121, 1.258)
Suitability of EML for village clinic (Reference=Inappropriate)				
Appropriate	0.000**	6.338 (4.065, 9.882)	0.000**	5.598 (3.336,9.393)
Satisfaction of EML to basic medical needs (Reference=Dissatisfied)				
Satisfied	0.000**	3.671 (2.412, 5.586)	0.000**	2.829 (1.706, 4.694)
Satisfaction of EML to patients with hypertension (Reference=Dissatisfied)				
Satisfied	0.002**	2.083 (1.298, 3.343)	0.089	1.767 (0.916, 3.411)
Satisfaction of EML to patients with diabetes (Reference=Dissatisfied)				
Satisfied	0.035*	1.584 (1.033, 2.429)	0.327	0.736 (0.400, 1.357)
Satisfaction of EML to Children with upper respiratory tract infection (Reference=Dissatisfied)				
Satisfied	0.002**	1.875 (1.251, 2.811)	0.964	1.011 (0.605, 1.693)

*$P<0.05$, **$P<0.01$

of the national EML and related supporting policies will have adaptive problems. More than 30% of 307 EMs in the first edition of the EML have been rarely used in village clinics[17]. Hypertension, diabetes and upper respiratory tract infection are common diseases in rural areas of the three provinces[18], but only few drugs in the EML are dedicated for treatment of these diseases. The study result shows that "Suitability of EML to village clinic" and "Satisfaction of EML to basic medical needs" will directly affect the attitudes of village doctors on the EML. In addition to implementing national EML, provincial EML, which is in accordance with EM demand, has been issued in three provinces. However, it played a minor role in supplementing EML because provincial supplementary EML was limited.

On the national level, although the first edition of EML (edition 2009) was revised in 2012 and in 2018, it was obvious that revision of EML was slow, leading to more complaints from primary health doctors in that their therapeutic abilities were affected. On the individual level, the policy of funding public hospital by medicine sales has been implemented for many years in China, the most village doctors were to increase income by prescribing[19]. After the implementation of the NEMP in 2009, this policy has been abolished, but it means reduction of village doctors' income. Hence, the Chinese government should improve national EMLs in a timely manner to meet the needs of village-based care. Based on the WHO's and Australia's NEMP to dynamically adjust procedures[20], a specialized agency in China should be established for evaluation, selection and adjustment of EM. More importantly, the central and local governments need to offer financial subsidy to make up for reduced village doctors' income from EMs use[21] and to ensure a sustainable development of the village clinics[22].

3.2 Distribution of EM is Still Inefficient

The distribution of EM plays a vital role in the implementation of EML. With the national EML issuing, the concentration of the medical market at the grass-root level increases, and a new business growth point has been brought to pharmaceutical distribution enterprises[23]. However, the phenomenon of untimely and inefficient distribution of EM in rural areas is widespread. Firstly, the phenomenon is restricted by geospatial factors. "More village clinics and less dosage" is a typical feature of EM delivery. The cost of distributing EM to village clinics is too high, and a large number of enterprises choose to delay or give up distribution in remote village clinics, resulting in an inefficient process[24]. Secondly, from the perspective of the market, the phenomenon of subcontracting the distribution of EM is also widespread. Some companies tried to reduce the distribution cost by directly distributing EMs to village clinics. However, this method is difficult to spread in rural areas because of their poor transportation conditions and low market demand[25]. Thirdly, from the perspective of distribution capability, the three provinces tended to choose well-funded distribution enterprises. However, customers of these enterprises concentrated on the medical institutions of the city level and above, had no experience of distributing EMs to the village clinics and influenced the timeliness of the distribution.

In the distribution of EM, the provinces should break the boundaries of administrative divisions. Based on factors such as distribution of health resources, population density and distance of village clinics, regional integration was adopted to identify distribution enterprises. Finally, we achieve centralised distribution, shortened distance, reduced cost and improved efficiency. The centralized distribution can promote distribution efficiency of EMs in village clinics. In addition, the centralised distribution enterprises should be bundled with all kinds of EMs, which ensure the effective distribution of EMs with

low profit and low dosage in village clinics[26]. In terms of distribution price, the local government subsidised distribution enterprises through differential pricing of EM in remote areas to improve the enthusiasm of the enterprises and ensure the timeliness of EM delivery[27].

3.3 Village Doctors Lack Enough Knowledge of EML

The training of village doctors will directly determine their familiarity with the EML[28]. In 2013, the Chinese government issued a new edition of the national guidelines for the clinical application of essential medicine and the national essential medicine prescriptions as a supplementary document of the national EML (edition 2012). However, several situations exist wherein training is not implemented. Although some rural primary health institutions have centralized training because of the training environment, training methods and low education level of village doctors, problems in teaching, such as unserious teaching and formalism, exist[29]. Under the pressure of basic medical care and public health services, village doctors are compressing learning time[30]. Whether NEMP is implemented smoothly, training is the key step. According to the actual needs of village doctors, training for EML should be increased[31] and training formalism should be eliminated. We should enhance the identification of village doctors on the EML and the awareness of rational drug use to ensure the operation of NEMP in village clinics.

3.4 Limitation

This study presents several limitations. Firstly, we only focused on six counties in China and our samples were not randomly selected, which might compromise the generalizability of our research. Secondly, this study did not investigate villagers in the three provinces, so we could not compare the current implementing status of EML from the perspective of supply and demand sides. Finally, the study mainly focused on quantitative analysis, and lacked evidence for in-depth interviews with village doctors, which may lead to the neglect of some deep-seated problems in the NEMP research.

4 CONCLUSION

Current EML cannot satisfy the health needs of villagers to some extent, and the accessibility and efficiency of EM distribution should be improved. The government should adjust EML regularly and focus on treatment of common diseases in rural areas. The government should also attach importance to the distribution of EM, strictly screen distribution enterprises, optimize distribution methods and ensure the supply of EM in village clinics. Moreover, the government should promote village doctors' familiarity with the national EML and the enthusiasm to implement the policy.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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