Multi-center investigation on personnel training and scientific research status of pharmacy intravenous admixture services (PIVAS) in mainland China based on the perspectives of PIVAS leaders

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Abstract

Background: We sought to analyze the current situation of personnel training and scientific research regarding pharmacy intravenous admixture services (PIVAS), to provide evidence-based medical knowledge to inform personnel training for PIVAS in mainland China.

Methods: A cross-sectional survey was used to examine the current status of PIVAS personnel training, research capabilities, needs, and research output of PIVAS personnel based from the perspective of leaders in PIVAS in China. The survey period was from March to April 2019.

Results: A total of 137 hospitals in China participated in this survey. The main training content areas of PIVAS staff in each hospital were professional theoretical knowledge (100.00%, 137/137) and practical operation ability (98.54%, 135/137). The frequency of training was typically 1–2 times/month (56.9%, 78/137). The average duration of a single training session was typically 1 hour or less (68.6%, 94/137). The most common forms of PIVAS training were lectures (94.89%, 130/137) and practical operations (79.56%, 109/137). A total of 51.8% (71/137) of PIVAS leaders believed that PIVAS personnel had a high degree of scientific research needs, but 61.3% (84/137) believed that few personnel had mastered scientific research methodology, and 41.6% (57/137) believed that the scientific research ability of personnel was relatively poor. Among PIVAS personnel, only 38.7% (53/137) had specialized scientific training. The annual SCI output was 0–18 articles (median 0 articles) and the number of national-level funding grants was 0–2 (median 0). There were no significant differences in the training of PIVAS personnel and scientific research between different provinces and hospital levels.

Conclusions: The training content of PIVAS personnel in China was found to be relatively rich, but management tools, career development, and training in scientific research were found to be relatively weak, and the scientific research output was very low. It is necessary to build a comprehensive training system for career development among PIVAS personnel.

Background

Pharmacy intravenous admixture services (PIVAS) are focused on the design of clean working areas based on the characteristics of a drug. PIVAS personnel are typically trained qualified pharmaceutical professionals who perform centralized configuration of intravenous medication in strict accordance with standard operating procedures [1]. PIVAS is an advanced work specialty that transforms the configuration of intravenous drugs distributed in each ward into a centralized configuration for all intravenous medications. Thus, PIVAS can improve work efficiency and the safety of intravenous infusion, ensure the rationality of drug use, and cut down the costs of drug configuration [2]. To ensure the normal operation and effectiveness of PIVAS, personnel must have a high level of professional skill. Thus, advanced personnel training is an important area for PIVAS [3–4].

In 2019, we systematically evaluated research on personnel training in PIVAS in mainland China [5]. The review identified five studies, revealing differences in training objectives, training targets, specific contents and evaluation indicators of PIVAS pharmacist training models in different regions of mainland China, highlighting the need to establish a standardized and multi-level PIVAS personnel training model [5]. Scientific

research training is an important part of personnel training in PIVAS. Miao et al. [6] reported that the establishment of a scientific research learning group in PIVAS could alleviate employee burnout to some extent [6]. However, in 2013, Zhang et al. found that PIVAS personnel had relatively low awareness of scientific research, and published very few papers [7].

These previous studies were single-center studies without representative samples, and no previous studies have examined the current status of PIVAS personnel training and scientific research training for PIVAS personnel in mainland China. Therefore, we used a cross-sectional study design to assess the current status of personnel training and scientific research based on the perspectives of PIVAS leaders in various hospitals. In addition, we sought to investigate differences in the training of PIVAS personnel and scientific research in different provinces and hospitals, to provide evidence-based medical evidence for training of PIVAS personnel in mainland China.

Methods

Participants

PIVAS leaders in domestic hospitals who were members of the Intravenous Dispensing Management and Application Branch of the China Medical Education Association were selected as participants. We distributed online questionnaires through a WeChat group, and the survey period was from March 2019 to April 2019.

Survey content

This study used a cross-sectional survey method to collect data using a questionnaire constructed by the authors. The questionnaire content included: (1) Basic information about PIVAS: the area at which the PIVAS personnel were located, and the level of the hospital; (2) Personnel training: content of training, frequency of personnel training, average training duration, form of training, and the sourcing of trainers; (3) Scientific research training: the need for scientific research, interest in scientific research, mastery of the methodology of scientific research, scientific research ability, frequency of scientific research training, and the average time taken for scientific research training; (4) The output of scientific research and demand: the number and types of articles published, and the number and types of project funding grants received.

Statistical methods

SPSS 21.0 (SPSS Inc., Chicago, IL, U.S.A.) software was used to analyze the data. For continuous variables, if the data followed a normal distribution, the measurement data were expressed as ($x \pm s$), and a t-test or analysis of variance was used. If the data did not follow a normal distribution, a rank sum test was used. For categorical variables, a chi-square test was used. Differences were considered statistically significant if $P < 0.05$.

Results

Basic information of participants

A total of 137 valid questionnaires were collected through a WeChat group. Regarding the geographic location of PIVAS personnel, 56.2% (77/137) of the respondents were located in eastern China, 27.0% (37/137) were in western China, and 16.8% (23/137) were in central China. Regarding the hospital level, 74.4% (102/137) of PIVAS personnel were located in Level III Grade A hospitals, 13.9% (19/137) were located in Level III Grade B hospitals, and 11.7% (16/137) were located in Level II Grade A hospitals.

Basic information regarding personnel training in PIVAS (Table 1)

The main contents of personnel training in PIVAS included theoretical knowledge (100.00%, 137/137), practical ability (98.54%, 135/137), pre-job training (98.54%, 135/137), communication skills (96.35%, 132/137), standard operating procedures (94.89%, 130/137), job responsibilities (94.16%, 129/137), emergency planning (91.97%, 126/137), occupational mental health, work ethics and laws and regulations (82.48%, 113/137) and management systems (81.75%, 112/137). Training in comprehensive ability development (50.36%, 69/137) and career development planning (35.77%, 49/137) were relatively low. The frequency of personnel training was typically 1–2 times/month (56.9%, 78/137). The most common average duration of a training session was 1 hour or less (68.6%, 94/137).

Basic information regarding scientific research training in PIVAS (Table 2)

Although 51.8% (71/137) of PIVAS leaders believed that PIVAS personnel had a high degree of scientific research need, and 27% (37/137) believed that personnel had a strong interest in scientific research, 71.5% (98/137) of participants believed that few PIVAS personnel have mastered the methodologies of scientific research. Furthermore, 51.8% (71/137) of participants believed that the scientific research ability of PIVAS personnel was relatively poor. Among PIVAS personnel, only 38.7% (53/137) had specialized training for scientific research, and the frequency of scientific research training for most PIVAS personnel was less than once per month (24.8%, 34/137). The most common average durations of scientific research training sessions were 1 hour or less (17.5%, 24/53) and 1–2 hours (19.0%, 26/53). The content of scientific research training mainly included article writing (79.2%, 42/53), literature review (77.4%, 41/53), research topics (69.8%, 37/53), and training in evidence-based pharmacy (43.4%, 23/53). Training sessions on experimental techniques (35.8%,19/53), statistical methods (35.8%, 19/53) and experimental interpretation (30.2%,16/53) were relatively uncommon.

The numbers and types of articles published by PIVAS personnel in the 137 hospitals each year were as follows: SCI (0–18 articles [median: 0], average 0.29 ± 1.70), Medline (0–10 articles [median: 0], average 0.19 ± 1.09), Chinese core journals (0–8 articles [median: 1], average 0.98 ± 1.32), and general journals (0–25 articles [median: 1.5], average 2.37 ± 4.13). The number and types of project funding each year were as follows: national level (0–2 funding [median: 0], average 0.09 ± 0.33), provincial level (0–24 funding [median: 0], average 0.39 ± 2.09); city level (0–6 funding [median: 0], average 0.27 ± 0.68).

Differences between personnel training and scientific research training in different provinces and hospital levels (Table 3)

According to the type of data, chi-square tests or rank sum tests were conducted to examine the differences between personnel training and scientific research training in different provinces and hospital levels. The

results revealed no significant differences between the frequency of personnel training, average training time, need for scientific research, mastery of the methodology of scientific research, scientific research ability, frequency of scientific research training, average time for scientific research training, and the number of project funding grants between different provinces and hospital levels. In addition, there were no significant differences between interest in scientific research in hospitals of different levels, or in the number or type of articles published, except for a difference in the number of articles published in Chinese core journals between different provinces. However, there was a significant difference between interest in scientific research between different provinces, revealing that personnel from western China and central China had a higher level of interest in scientific research compared with those from eastern China (x^2 = 18.876, P = 0.016). In addition, the number of articles published in Chinese core journals was greater in Level III Grade A hospitals and Level III Grade B hospitals compared with Level II Grade A hospitals, and this difference was significant (F = 6.186, P = 0.045).

Discussion

The current study was a multi-center investigation of personnel training and scientific research status of PIVAS in mainland China. A sample of 137 leaders in PIVAS from various regions participated in this survey. The results revealed that the training content of PIVAS personnel mainly included professional theoretical knowledge, practical ability, pre-job training, communication skills, standard operating procedures, job responsibilities and emergency planning. The “Regulations on the Quality Management of Centralized Dispensing of Intravenous Drugs” published by the Ministry of Health in China require that all PIVAS personnel must undergo strict and effective pre-job training to ensure that they understand the purpose and significance of PIVAS and master the necessary technical operation skills [8], so personnel training is an important aspect of PIVAS. However, because China has not established a standardized and multi-level PIVAS personnel training model, there are some differences in the training content of PIVAS personnel in various hospitals in different provinces in China. Nevertheless, as an example, Yunnan Province has formulated a “Training Plan and Outline of Yunnan Provincial Administration of PIVAS”, indicating that the region has its own training plan for PIVAS personnel [9]. Thus, it is necessary to establish a national training program to promote the development of PIVAS in mainland China. In addition, the current findings revealed that the frequency of personnel training was typically 1–2 times/month and the average training session duration was within 1 hour, possibly because PIVAS personnel typically have early working hours, high work pressure and high work intensity [10], and therefore potentially have insufficient time to attend training. Thus, it may be particularly important to pay attention to the physical and mental health of PIVAS employees.

Overall, the scientific research ability of PIVAS personnel was found to be relatively poor, and the average annual number of scientific research output articles and project funding grants was low. There are several potential reasons for these findings: (1) PIVAS personnel are typically focused solely on configuration of intravenous medication, leading to relatively low awareness of scientific research; (2) PIVAS personnel have not mastered the basic methods of scientific research, with weak scientific research foundations; and (3) skills training in PIVAS is emphasized, but scientific research training is relatively neglected [16]. Thus, it is important to improve the scientific research capacity of PIVAS personnel.

Although the current study is the first large-scale, multi-center cross-sectional study of the current status of PIVAS personnel training in China, it included several limitations. First, we were not able to perform random sampling because we did not know the total number and distribution of PIVAS personnel in mainland China. However, because 137 PIVAS personnel from various regions of China were included in our study, the results are likely to at least partially reflect the current status of PIVAS personnel training in China. Second, all data were collected from PIVAS leaders, so some discrepancies (i.e., research ability, interests) may exist between the current findings and the actual situation among the wider population of PIVAS personnel. Finally, as a cross-sectional study, we were unable to make causal inferences.

Conclusions

The training content of PIVAS personnel in China is relatively rich, but management tools, career development, and training in scientific research level are relatively weak, and the output of scientific research is very low. It is necessary to build a comprehensive training system for career development among PIVAS personnel.

Abbreviations

PIVAS
pharmacy intravenous admixture services;

Declarations

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Contributors

CY and YL designed the review, collected data, carried out analysis and interpretation of the data and wrote the review. LZ and LLZ designed the review, collected data, checked the data and wrote the review.

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Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available because they are subject to the West China Second University Hospital, Sichuan University. However, the data and materials are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

All participants completed and signed an informed consent form before the survey started. This study was approved by the Institutional Review Board of West China Second University Hospital, Sichuan University.

Consent for publication

As this manuscript contains no individual personal data, this section is not applicable.

Conflict of Interest

The authors declare that they have no competing interests

References

[1]Hu wei, Lu chao, Liu liping, Liang min. Experience in the construction and work of pharmacy intravenous admixture services in our hospital [J]. China pharmaceutical industry, 2011,20(19):58-60.

[2]Wang xin. Construction and development of pharmaceutical team in pharmacy intravenous admixture services in our hospital [J]. Journal of clinical rational drug use,2016, 9 (04) :163-164.

[3] Zhang jun. Personnel Training and Establishment of Quality Control Management System in PIVAS [J]. China pharmacy,2010,21 (41):3888-3889.

[4]Mi wenjie, Chen ji, Li lin. Basic operation guidelines for the centralized administration of intravenous drugs [M]. Beijing: People's Health Publishing House, 2017:30.

[5] Yang chunsong, Zhang lingli, Lin yunzhu, et al. Evidenced-based Evaluation of Personnel Training Mode in Pharmacy Intravenous Admixture Services in China [J]. China pharmacy,2019,30(5):708-711.

[6]Miao shikai. The effect of the establishment of a scientific research team in the PIVAS on improving employee burnout [J]. World Latest Medicine Information, 2008,18 (71):221-222.

[7]Zhang xianming, Luo jianhua. Current Situation of Hospital Staff of the Pharmacy Intravenous Admixture Services [J]. Journal of pediatric pharmacy,2013,19 (12):46-48.

[8]Zhang jun, Hou jianhong, Yin jiafu, et al. Formulation of PIVAS Acceptance Criteria and Establishment of the Personnel Training and Assessment Method in Yunnan Province [J]. China pharmacy,2011,22(45):4233-4235.

[9]Zhu jianning, Chen ying, Xiao shuwen,et al. Establishment and Practice of Pre-job Training Mode of PIVAS Staff in Our Hospital [J]. China pharmacy,2015,26(01):80-82.

[10] Wang minghui, Zhang yanhua. Discussion on the Practice of New Employees Training in PIVAS of Our Hospital [J]. China pharmacy,2012,23(09): 814-816.

Tables

Table 1: Basic information of staff training in PIVAS

Training Item	Option	Percentage (Frequency / Total)
Content of training	Professional theoretical knowledge	100.00%(137/137)
	Practical ability	98.54%(135/137)
	Pre-job training	98.54%(135/137)
	Communication skills	96.35%(132/137)
	Standard operating procedures	94.89%(130/137)
	Job Responsibilities	94.16%(129/137)
	Emergency plan for emergencies	91.97%(126/137)
	Occupational mental health, work ethics and laws and regulations	82.48%(113/137)
	Management system	81.75%(112/137)
	Continuing education learning ability	71.53%(98/137)
	Ability to share experiences	67.15%(92/137)
	Teaching ability	62.77%(86/137)
	Management ability	62.04%(85/137)
	Management tools	51.09%(70/137)
	Comprehensive ability development	50.36%(69/137)
	Career development plan	35.77%(49/137)
Frequency of personnel training	<1 time /month	8.0%(11/137)
	1-2 time /month	56.9%(78/137)
	3-4 time /month	27.0%(37/137)
	≥5 time /month	8.0%(11/137)
Average training duration	<1h	68.6%(94/137)
	1-2h	30.7%(42/137)
	3-4h	0.7%(1/137)
	>4h	0% (0/137)
Form of training	Lecture	94.89%(130/137)
	Hands-on training	79.56%(109/137)
	Outgoing training	65.69%(90/137)
	Seminar	44.53%(61/137)
	Online teaching	22.63%(31/137)
Sourcing of trainers	PIVAS	94.89%(130/137)
	Department of Pharmacy	74.45%(102/137)
	Out-of-hospital expert	52.55%(72/137)
	Department of Nursing	34.31%(47/137)
	The clinician	31.39%(43/137)

Table 2: Basic information of scientific research training in PIVAS

Training Item	Option	Percentage (Frequency / Total)
The need for scientific research	Very low	2.2%(3/137)
	Relatively low	7.3%(10/137)
	General	38.7%(53/137)
	Relatively high	38.7%(53/137)
	Very high	13.1%(18/137)
Interest in scientific research	Very low	6.6%(9/137)
	Relatively low	18.2%(25/137)
	General	48.2%(66/137)
	Relatively high	21.9%(30/137)
	Very high	5.1%(7/137)
Mastery of the methodology of scientific research	Nobody	10.2%(14/137)
	Very few people	61.3%(84/137)
	Half people	2.9%(4/137)
	Most of the people	24.8%(34/137)
	All people	0.7%(1/137)
Scientific research ability	Very bad	10.2%(14/137)
	Relatively poor	41.6%(57/137)
	General	41.6%(57/137)
	Better	6.6%(9/137)
	Very good	0%(0/137)
Frequency of scientific research training	None	62%(85/137)
	<1 time/month	24.8%(34/137)
	1-2 time/month	9.5%(13/137)
	3-4 time/month	0%(0/137)
	≥5 time/month	2.2%(2/137)
	unclear	5.7%(3/137)
Average time taken for scientific research training	None	62%(85/137)
	<1h	17.5%(24/53)
	1-2h	19.0%(26/53)
	3-4h	1.5%(2/53)
	≥4h	0%(0/54)
The content of scientific research training	Article writing	79.2%(42/53)
	Literature review	77.4%(41/53)
	Research topics	69.8%(37/53)
	Research design	49.1%(26/53)
	Evidence-based pharmacy	43.4%(23/53)
	Experimental technique	35.8%(19/53)
	Statistical methods	35.8%(19/53)
	Experimental interpretation	30.2%(16/53)

Table 3: Relations between PIVAS personnel training and provinces and hospital level

Training Item	Option	Eastern China	Western China	Central China	/F	P	Level III Grade A hospital	Level III Grade B hospital	Level IIGrade A hospital	/F	P
Frequency of personnel training	<1 time /month	6	4	1	10.446	0.107	6	1	4	8.975	0.175
	1-2 time /month	39	20	19			61	9	8		
	3-4 time /month	24	10	3			27	6	4		
	≥5 time /month	8	3	0			8	3	0		
Average training duration	<1h	52	24	18	2.443	0.655	69	12	13	2.140	0.710
	1-2h	24	13	5			32	7	3		
	3-4h	1	0	0			1	0	0		
The need for scientific research	Very low	2	0	1	6.434	0.599	2	0	1	3.661	0.886
	Relatively low	3	4	3			8	1	1		
	General	33	12	8			40	9	4		
	Relatively high	29	15	9			39	7	7		
	Very high	10	6	2			13	2	3		
Interest in scientific research	Very low	7	0	2	18.876	0.016	5	2	2	7.929	0.440
	Relatively low	11	5	9			21	3	1		
	General	40	20	6			48	9	9		
	Relatively high	16(24.7)	8(32.4)	6(26)			23	5	2		
	Very high	3	4	0			5	0	2		
Mastery of the methodology of scientific research	Nobody	6	5	3	10.031	0.263	8	1	5	11.785	0.161
	Very few people	46	23	15			68	9	7		
	Half people	4	0	0			3	1	0		
	Most of the people	21	9	4			22	8	4		
	All people	0	0	1			1	0	0		
Scientific research ability	Very bad	8	4	2	7.243	0.299	10	1	3	4.590	0.597
	Relatively poor	30	13	14			43	7	7		
	General	33	19	5			44	9	4		
	Better	6	1	2			5	2	2		
	Very good	0	0	0			0	0	0		
Frequency of scientific research training	None	43	26	16	9.327	0.315	59	13	13	6.054	0.641
	<1 time/month	19	9	6			28	4	2		
	1-2 time/month	10	2	1			10	2	1		
	3-4 time/month	0	0	0			0	0	0		
	≥5	2	0	0			2	0	0		

	time/month										
	unclear	3	0	0			3	0	0		
Average time taken for scientific research training	None	43	26	16	4.470	0.613	59	13	13	5.612	0.468
	<1h	15	5	4			21	2	1		
	1-2h	18	5	3			20	4	2		
	3-4h	1	1	0			2	0	0		
Number of articles published	SCI	0.44±2.23	0.12±0.39	0.09±0.29	0.640	0.726	0.29±1.80	0.53±1.84	0.06±0.25	0.822	0.663
	Medline	0.31±1.43	0.05±0.23	0.04±0.21	0.490	0.783	0.19±1.12	0.32±1.38	0.06±0.25	0.051	0.975
	Chinese core journals	1.16±1.41	0.80±1.32	0.67±0.87	4.564	0.102	1.06±1.34	0.95±1.18	0.50±1.32	6.186	0.045
	Chinese General Journal	2.59±4.61	2.28±4.13	1.78±1.86	0.532	0.767	2.38±4.11	3.37±5.48	1.13±1.36	2.315	0.314
Types of project funding grants received	National level	0.11±0.39	0.08±0.28	0.04±0.21	0.551	0.759	0.08±0.31	0.16±0.50	0.06±0.25	0.280	0.869
	Provincial level	0.52±2.77	0.28±0.45	0.13±0.34	2.596	0.273	0.27±0.56	1.32±5.50	0.06±0.25	3.825	0.148
	City level	0.31±0.80	0.19±0.46	0.27±0.54	0.924	0.630	0.28±0.75	0.32±0.48	0.19±0.40	1.073	0.585