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Original Article

Occupational Health Protection for Health Workers in China With Lessons Learned From the UK: Qualitative Interview and Policy Analysis

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ABSTRACT

Background: Healthcare settings have been recognized among the most hazardous places to work. Based on the five categories of occupational hazards that were identified by the ILO and WHO, this study aimed to analyze policy framework relevant to occupational health protection of health workers (HWs) in public health service in China, then discussed how to share the experience of the National Health Service (NHS) England for improvement.

Methods: Based on policy learning theories, policy analysis and qualitative interview were used in this study.

Results: In the Chinese public health service, at least five laws related to the regulation of occupational health protection for HWs; however, enforcement of relevant laws was separated and multi-centered; the national monitoring system, which targeted to occupational hazards and health outcome for HWs in China, had yet to be developed; the top three priorities were workplace violence, bloodborne pathogens, and musculoskeletal disorders; national strategies included Security Hospital, and Healthy China 2030. In NHS England, three laws were fundamental; several monitoring systems had been set up, including NHS Staff Survey, Commissioning for Quality and Innovation incentive scheme; mental health, musculoskeletal problem, and nutrition disorder and overweight were raised great concern; Health and Safety, and NHS Healthy Workforce Program were critical nationwide strategies.

Conclusion: There were several similarities as well as differences between the Chinese public health system and NHS England, which laid foundation of learning by China. Recommendations of improving occupational health policies in China were provided, based on the lessons learned from the NHS England.

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1. Introduction

Healthcare settings have been recognized among the most hazardous places to work. Five categories of occupational hazards for health workers (HWs) were particularly identified by the International Labor Organization (ILO) and World Health Organization (WHO): (1) biological hazards (e.g., bloodborne pathogens, airborne pathogens), (2) physical hazards (e.g., noise, X-rays), (3) poor ergonomic or work design hazards (e.g., handling and lifting patients, repetitive movements), (4) workplace stress and psychosocial hazards (e.g., discrimination, stigma, and violence), (5) chemical hazards (e.g., cleaning fluids, cytotoxic drugs) [1].

The general awareness of occupational health for HWs in China was particularly raised since the SARS outbreak in 2003; HW was the most vulnerable group suffering infection and death caused by SARS; a recently published report revealed that 917 SARS cases were HWs among the total 4,698 cases in 2003 [2]. Thereafter, a growing number of articles were published on this issue in China. Nevertheless, most literature addressed the issue from the perspective of single occupational hazard, while there were few articles focusing on the overall policy framework of occupational

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health [3]. Furthermore, no article is available for comparing the policy framework in China with another country. Because of the awarding of the Chevening Fellowship for the first author of this article, he was invited to conduct a visiting research in the UK from July 2017 to January 2018, there was an opportunity for the authors to design a study on policy framework of occupational health protection for HWs in Chinese public health service and shared the lessons from the National Health System (NHS) England in the UK.

Policy learning theories, particularly on lesson-drawing, suggested that policy makers can learn from their counterparts in other countries, as most issues to be addressed could be common in different countries. However, lesson-drawing did not automatically lead to successful policy outcomes, considering that differences among economic, social, and political contexts, historical practices should be also taken into account [4].

In 2019, there were 12.9 million HWs in China, with over nine million of them worked in the Chinese public health service [5]. This number represented one-fifth of the 43 million health workforce across the world [6]. Meanwhile, more than 1.3 million staff worked for NHS, which was in fact the largest employer in the UK [7].

In this article, we developed a policy framework relevant to occupational health protection of HWs, analyzed comparative characteristics of Chinese public health service with that in the NHS England, and discussed implications of our key findings. We hope that this study could share lessons for China to improve occupational health protection of HWs within its own health system.

2. Materials and methods

2.1. Study design

This study started since the second half of 2017 when a common interest was developed by the authors. The study was conducted with a qualitative interview and policy analysis. Qualitative interviews were completed by the end of 2017 in the UK, while by the end of 2018 in China. Patients and public were not involved in the design or conducting of the study.

Based on the five categories of occupational hazards that were identified by the ILO and WHO [1], the policy framework was a two-dimensional context; there were policies (laws, monitoring, priorities, and strategies) in the vertical level across each of the five categories of occupational hazards in horizontal level. Our qualitative interview and policy analysis were based on the four-level semi-structured questions, within the context of Chinese public health service and the NHS England: Firstly, how is each occupational hazard regulated in legislation? Secondly, how does the monitoring system work for each occupational hazard and its health outcome of HWs? Thirdly, what are the top three challenges encountered at the practical level? Lastly, what strategies have been promoted for the top three priorities?

In this article, the descriptive results from qualitative interview and policy analysis were presented at the section of Results; furthermore, the in-depth analysis results from them were presented in the section of Discussion.

2.2. Qualitative interview

The qualitative review implemented by using the semi-structured approach, as showed in Section 2.1, supports to understand in-depth situation of the policies. The inclusion criteria of interviewee were as follows: (1) the interviewee was a manager, researcher, or health professional who was relevant to Chinese public health institution or the NHS; (2) we obtained verbal informed concern from interviewee to present his/her responses in an anonymous way; (3) the interviewee came from previous professional contact or recommended by his/her employer.

We interviewed 17 people in total; in particular, seven of them were relevant to NHS issues and worked in the UK, 10 of them were relevant to Chinese public health service and worked in China. Of the 17 interviewees, the basic sociodemographic characteristics were gender (9 female, 8 male), occupation (9 health professional, 5 manager, 3 researcher), and organization (11 public hospital, 2 community health center, 4 university).

Interviews were conducted in face-to-face meeting, combined with follow-up communication via e-mail and/or telephone. Interview recordings were transcribed verbatim, thematic analysis of the interview data was undertaken by using EXCEL and NVivo 12.0, and the meanings behind the transcribed text were captured and coding.

2.3. Policy analysis

Supported by the basic research of the authors and primarily information from interviewees, updated national and international policies and policy documents were searched, the searching terms were “health worker,” “health professional,” “staff,” “health human resources,” as well as “occupational health,”,= “occupational safety and health,” and “health and wellbeing” in Chinese and English, respectively. Publicly available documents were mainly collected from the government's websites, including China's websites of the National Peoples' Congress of P. R. of China, the National Health and Family Planning Commission of P. R. of China (the former Ministry of the National Health Commission), the National Health Commission of P.R. of China, and the Ministry of Human Resource and Social Security of P.R. of China, as well as UK's websites of the Department of Health, the NHS, the NHS England. For official policies that were unavailable online, printed copies and literature were collected.

As a result, more than 50 documents were available; most of the included documents in this article were published after 2010. Policy analysis was conducted by the authors while interacting with the qualitative interview. On the basis of a review of available policies, we were able to identify the main milestones of policy development and implementation, record the description of detail requirements of policies, discuss the idea from interviewees about policies, then formulate the opinions of authors.

3. Results

3.1. Situation of Chinese public health service

3.1.1. Laws

At the legislative level, the administration and law enforcement on occupational health protection for HWs were separated and multicentered, at least relevant to five laws [8,9]:

(1) The Law of the People's Republic of China on Prevention and Control of Occupational Diseases (adopted in 2001, amended in 2011, 2016, 2017, and 2018) is the core and cornerstone in the Chinese occupational health regulatory system. The law is applicable for all enterprises and public organizations, including healthcare settings; it is the responsibility of employer to take preventive measures against occupational diseases, to control and eliminate occupational hazards.
(2) The Law of the People's Republic of China on the Prevention and Treatment of Infectious Diseases (adopted in 1989, amended in 2004 and 2013) requires to establish strict supervision and control systems over the staff who work with

samples of the pathogens of infectious diseases in accordance with the specified measures and to subsidize or compensate the worker who is caused disease, disable or casualty due to the participation in infectious diseases prevention and treatment, including HWs.
(3) The Law of the People's Republic of China on Work Safety (adopted in 2002, amended in 2009 and 2014) covers all entities engaged in production and other business activities.
(4) The Law of the People's Republic of China on Mental Health (adopted in 2012) promulgates that all employers shall create a work environment conducive to the physical and psychological health of employees.
(5) In December 2019, the Law of the People's Republic of China on Basic Medicare and Health Promotion was adopted by the top national legislature, as the country's first fundamental and comprehensive law on basic medical and health care. By taking into force on June 1, 2020, the law bans any organization or individual from threatening or harming the personal safety or dignity of HWs.

3.1.2. Monitoring

The national monitoring system, which targeted to occupational hazards and health outcome for HWs in China, however, had yet to be developed. Thus, no official statistics and publication at the national level on this issue were available.

3.1.3. Priorities

Under the support of qualitative interview and policy analysis, the top three priorities of occupational hazards among public health facilities in China were primarily identified as workplace violence, bloodborne pathogens, and musculoskeletal disorders (MSDs); they were typical occupational hazards of psychosocial, biological, and ergonomic, respectively. The unsatisfactory of quality and quantity of staff was of great concern for leading to the increase of occupational hazards.

In general, occupational hazards relevant to physical and chemical hazards were not prioritized by the interviewees and policies; relatively, HWs may be classified as being better protected against physical and chemical hazards.

3.1.4. Strategies

At the strategy level, a national campaign entitled “Security Hospital” had been launched by the central government against external violence toward HWs since 2015. Public hospitals were encouraged to provide several support services to health workers, including training on communicating with patients and essential knowledge regarding security protection, buying medical liability insurance [10].

Since 2013, a systematic approach toward the upgraded health and wellbeing of HWs was promoted, by integrating national and international instruments/technical tools, with special reference to the joint ILO/WHO product-HealthWISE, ILO/IEA (International Ergonomics Association) Ergonomic Checkpoints, and the Chinese national occupational health standard (Guideline for Prevention and Control for Occupational Exposure Bloodborne Pathogen). Furthermore, the Model of Hospital Initiative on Systematic Occupational Health (HISOH Model) was gradually established. The core of the HISOH Model was the maintenance of the possible highest degree of safety, health, and wellbeing of HWs, through a safer and healthier working environment, it was essential to develop a comprehensive management system with culture-building. The pilot projects had been successfully conducted in the top seven medical colleges in China and 130 hospitals across provinces, leading to the establishment of multisectoral and multidisciplinary networks [11,12].

Under the Chinese situation and the political commitment to the United Nations Sustainable Development Goals (UN SDGs), a national strategy of Healthy China 2030 was launched by the Chinese government in 2016, representing the first long-term strategic plan in the health sector in China since 1949. Accordingly, occupational health had been prioritized by the following Healthy China Action Plan (2019-2030) as one of its 15 major health projects (special campaigns). Objectives and indicators in this major health project of occupational health covered occupational hazards and wellbeing of workforce. In such a context, employers in the health sector and governmental organizations were encouraged to be the role models of occupational health protection [13].

3.2. Typical opinions from interviewees about the occupational hazards

Typical opinions from the Chinese interviewees across the occupational hazards were presented as follows:

(1) Biological hazards: *“To our nurse sisters, sharp injury were really scared, when we got accidental needle-stick or other sharp injury, after exposure, we must take medicine immediately, for several months, some nurses didn't tell their family what happened, but scared to death”* (A nurse of nurses department).
(2) Psychosocial hazard: *“In our hospital, department of pediatry was the highest risk workplace with occurrence of violence, especially in the night shift service, when long waiting queue, parents of sick children were anxious and aggressive, definitely, verbal violence was more common than physical violence, but still hurt us”* (A doctor of pediatry department).
(3) Psychosocial hazard: *“What ever, patients and visitors have different attitude toward doctors and nurses, they are more likely to please doctors, but vent their anger to nurse ”* (A nurse in inpatient department).
(4) Poor ergonomic or work design hazards: *“We kept walking during our duty in wards, in our smart phone moments, every day, nurses are always on the top ranking of walking step counting, when we faced tasks which need our tough physical activities, for example, lift patient, special body position, there was limit equipment can help us, back pain was quiet common ”* (A doctor of inpatient department).
(5) Poor ergonomic or work design hazards: *“Many of our staff are suffering disorder of muscle and skeleton, before and after working hour, if you come, you can see physicians or nurses get their self-help rehabilitation”* (A doctor of outpatient department).
(6) Psychosocial hazard, poor ergonomic or work design hazards: *‘”Medical students who graduate from top-ranking universities don't want to work in the emergency department, it is well known that we have lower payment, higher risk of violence and tougher physical work at here than in other places, basically, new comers are from second class medical universities”* (A director of general hospital).
(7) Psychosocial hazard: *“Plenty of female nurses work at our hospital, but we have only small number of male nurses, it is hard for female nurses when facing violence and long-lasting physical activities”* (A director of specialized hospital).

3.3. How the NHS England deals with the issue of occupational health protection for HWs

3.3.1. Laws

The conception of health, safety, and wellbeing of health workforce was established within the NHS system. The Health and

Safety at Work etc. Act 1974 and the Health and Social Care Act 2012 were fundamental for occupational health protection toward HWs. As a substantial part of the Health and Social Care Act 2012, NHS Constitution for England strengthened the point that staff's health, safety, and wellbeing were responsibilities of both employer and HWs. In part of staff rights, NHS pledged to "provide support and opportunities for staff to maintain their health and wellbeing and safety." NHS staff have a duty to "take reasonable care of health and safety at work, their team and others, and to co-operate with employers to ensure compliance with health and safety requirements" [14].

3.3.2. Monitoring

For the monitoring purpose, NHS Staff Survey in England was a countrywide data collection process taken place annually, requiring the participation of all NHS trusts. The survey was to help NHS organizations to review and improve staff experience. Five important indicators of the survey were particularly related to staff health, safety, and wellbeing: (1) errors and incidence, (2) health and wellbeing, (3) violence, (4) harassment and bullying, (5) working pattern [15].

Meanwhile, NHS England proposed a new national Commissioning for Quality and Innovation (CQUIN) incentive scheme in 2017. The scheme was to monitor and improve staff health and wellbeing, with the special focus on musculoskeletal, mental wellbeing, and weight management [16].

3.3.3. Priorities

We found the top three priorities for occupational health protection that were supported by qualitative interview and policy analysis: mental health (including workplace violence), musculoskeletal problem, and nutrition disorder and overweight; two of them were similar to the Chinese top priorities (workplace violence and MSDs). We also noticed that the staff shortage had become a critical risk of increasing occupational hazards toward staff, which was concerned by the interviewees.

By contrast, physical, biological, and chemical occupational hazards were not recognized as priorities by the interviewees and policies.

3.3.4. Strategies

At the strategy level, NHS England had developed a management system of Health and Safety Policy. The Health and Safety Policy Management System should be reviewed every two years or in the light of legislative or organizational change, with the aim to achieve the excellence in health and safety [17].

In terms of the bloodborne pathogens, which was identified as top priority in China (but it was not among the top three priorities in NHS England), several steps had been taken in the UK to protect the HWs from infection with bloodborne pathogens: (1) the health departments had issued guidance for protecting clinical healthcare workers against infection with bloodborne pathogens; (2) new regulations for the prevention of sharps injuries were introduced in the UK in 2013, all health care employers were required to provide the safest possible working environment by preventing or controlling the risk of sharps injuries; (3) the percentage of HWs vaccinated against hepatitis B was 90% of doctors, nurses, consultants, and community nurses in the UK [18,19].

The employer-led NHS Healthy Workforce Program was initiated in 2017, 11 NHS organizations had been working with the program to test different methods of delivering preventative and early intervention for staff health and wellbeing, the organizations were expected to provide support for their staff in two ways. First, by focusing on the organizational culture, and second, by introducing employer-led health and wellbeing schemes for staff [15].

3.4. Typical opinions from interviewees about the occupational hazards

Typical opinions from the UK interviewees across the occupational hazards were presented as follows:

(1) Psychosocial hazard: *"We have alone working policy, working alone to the community to see patients, often our patient got mental health issues, it is possible, a patient do have all sorts of issues and social problems "* (An occupational therapist).
(2) Psychosocial hazard: *"Most parts of staff complain are bullying, harassment, negotiation of workload, replacement of equipment*

Table 1
Overview of policy framework of occupational health protection for health workers in China and the UK

Health			Occupational hazards				
System	Framework	Item	Phy	Psy	Bio	Erg	Che
Chinese Public Health Service	Laws	Law on Prevention and Treatment of Infectious Diseases	N	N	Y	N	N
		Law on Prevention and Control of Occupational Diseases	Y	Y	Y	Y	Y
		Law on Work Safety	Y	N	N	N	Y
		Law on Mental Health	N	Y	N	N	N
		Law on Basic Medicare and Health Promotion	Y	Y	Y	Y	Y
	Monitoring	Non-exist	N	N	N	N	N
	Priorities	Workplace violence	N	Y	N	N	N
		Bloodborne pathogens	N	N	Y	N	N
		Musculoskeletal disorders	N	N	N	Y	N
	Strategies	Security Hospital	N	Y	N	N	N
		Healthy China 2030	Y	Y	Y	Y	Y
		HISOH Model	Y	Y	Y	Y	Y
NHS England	Laws	Health and Safety at Work etc. Act 1974	Y	N	Y	Y	Y
		Health and Social Care Act 2012	N	Y	N	N	N
		NHS Constitution for England	Y	Y	Y	Y	Y
	Monitoring	NHS Staff Survey	Y	Y	Y	Y	N
		Commissioning for Quality and Innovation Incentive Scheme	N	Y	N	Y	N
	Priorities	Mental health	N	Y	N	N	N
		Musculoskeletal problem	N	N	N	Y	N
		Nutrition disorder and over-weight	N	N	N	N	N
	Strategies	Health and Safety	Y	Y	Y	Y	Y
		NHS Healthy Workforce Program	N	Y	N	Y	N

Note: 1. Y means YES; N means NO.
2. Abbreviation: Phy (Physical); Psy (Psychosocial); Bio (Biological); Erg (Ergonomic); Che: (Chemical).

due to dangerous and priority " (A complaints coordinator and patients' liaison).

(3) Psychosocial hazard: *"Across the UK, stress has been big growing issue in the last couple decades, in 70s and 80s, it used to be musculoskeletal problem with a higher reasons for people being sick, while there is stress reason now, it is harder to manage, much complicated "* (A doctor of the school of medicine).

(4) Psychosocial hazard, poor ergonomic or work design hazards: *"One of the problems we have within health services is permission attitude of sick absence, especially for mental health, nutrition problems and* musculoskeletal problem, *at the moment, sickness absence rate for junior doctors is about 12%, which is very very high "* (A head of human resources).

(5) Psychosocial hazard: *"The main concerns of staffing gap are nurse, midwife, specialist of pediatry and emergency, dentist, and clerical staff, as a result of workplace violence and other issues, the vacancies for nurses are on top of all staff group "* (A doctor of corporate services).

3.5. Overview of the policy framework between Chinese public health service and the NHS England

Based on the above-mentioned analysis, a concise overview of policy framework between Chinese public health service and the NHS England is presented in Table 1.

In China, at least five laws were relevant to regulation of various occupational hazards for HWs. There was no national monitoring system on each of occupational hazards among HWs. Workplace violence, bloodborne pathogens, and MSDs were recognized as typical priorities of psychosocial, biological, and ergonomic occupational hazards, respectively. Security Hospital, Healthy China 2030, and HISOH Model were listed as major strategies, which had been promoted against the top three priorities.

In turn, in the UK, Health and Safety at Work etc. Act 1974, Health and Social Care Act 2012, and NHS Constitution for England were fundamental laws, which covered regulation of all occupational hazards. Two monitoring system (NHS Staff Survey, Commissioning for Quality, Innovation Incentive Scheme) were listed as major players, which covered four occupational hazards, except chemical hazards. Mental health, musculoskeletal problem, and nutrition disorder and overweight were prioritized as occupational health challenges, which reflected occupational hazards of psychosocial and ergonomic factors. Two strategies (Health and Safety, NHS Healthy Workforce Program) were critical strategies to cope with those occupational priorities.

4. Discussion

4.1. The basis of learning from the NHS England

From the perspectives of establishment background, financing mechanism, and reform process, similarities as well as differences between the Chinese public health system and the NHS system were identified. According to the policy learning theories, it is suggested that leaning from the NHS England is possible for the Chinese party based on some common ground while some differences should be noticed [20–23]:

(1) Both systems were created after the Second World War: the public health system in China was a founding element of the People's Republic of China in 1949, and the NHS in 1948 as a landmark pillar of the welfare state.

(2) Both systems heavily relied on public funding. In China, this was by the specific social health insurance schemes (urban employee, urban resident, and rural resident), which accounted for about 70% of health expenditure, with the remaining 30% financed by out of pocket money of individual. In the UK, funding for the NHS came directly from the taxation.

(3) From 1949 to 1977, the public health system in China was governed in a planning system. After 1977, as China's economy moved toward market-oriented mechanisms, the Chinese government launched reforms of its public health system. China's second round of health system reform began in 2009, its long-term strategy was to ensure the universal access to the basic healthcare system, through a sound governance with combination of planning and market orientation. The focus on governance of the NHS since 1979 had been on three successive attempts to make provider competition work, but this had been abandoned with the emphasis on integration.

4.2. Alignment among various law systems relevant to occupational health protection for HWs

In China, overlaps and gaps exist among several laws relevant to occupational health protection for HWs, in terms of domain and function of each law, leading to a fragmented and multicentered administration system. We suggest that the Law of the People's Republic of China on Prevention and Control of Occupational Diseases should provide aligned national leadership to the other specific laws on the issue of occupational health protection for HWs. Meanwhile, the Law of the People's Republic of China on Basic Medicare and Health Promotion is of great opportunity to integrate the rights and responsibilities of occupational health protection for HWs among health settings.

The terms of "occupational health (OH)," "occupational safety and health (OSH)," and "health and wellbeing (HWB)" are frequently used in the UK. From the perspectives of legislation and law enforcement in China, they are regulated by different laws, for instance, OH is under the Law of the People's Republic of China on Prevention and Control of Occupational Diseases, OSH is under the Law of the People's Republic of China on Work Safety, HWB has not been paid considerable attention in China.

Therefore, alignment among various law systems is critical for occupational health protection for HWs, concert law enforcement are urgently needed across individual law system, it is the shared responsibility among the government, employers, and HWs, as indicated by experience in the UK laws.

4.3. Sustainable occupational health monitoring among HWs

China urgently needs to develop a monitoring system for occupational health of HWs; the NHS Staff Survey set a good example in this practice. It should be an evidence-based occupational health monitoring system for HWs with systematic indicators, persisting work needs to be done to validate the indicators. As the occupational health challenges evolve, the emphasis should be gradually shifted.

Application of information technology is the key of sustainable monitoring system, including health surveillance for HWs. As suggested from our previous study, the notification system of patient complaint records in China can be modified to include more detailed information about patient and visitor violence and can be gradually expanded to HWs reports. This will be an even better source of information to guide further intervention against workplace violence [24].

4.4. The dynamic priorities of occupational health protection for HWs

There are strong evidences that health and wellbeing of HWs significantly link to service quality. In other words, patient safety is the outcome of health and wellbeing of HWs; population health cannot be achieved without healthy HW;, the ultimate goal of occupational health protection for HWs is health and wellbeing of the whole population [25]. Therefore, the WHO advocated the Theme of the World Patient Safety Day 2020 as “Health Worker Safety: A Priority for Patient Safety,” and the Slogan “Safe health workers, Safe patients” [26].

Under the different social economic context in China and the UK, in our study, the top three priorities of occupational health protection for HWs between Chinese public health service and NHS England are overlapped in MSDs and workplace violence/mental health. However, China is facing a particular challenge of exposure to bloodborne pathogens by high risk of needle-stick and other sharp injuries [27,28]. It is noted that workplace violence policies in China (e.g. Security Hospital) concern primarily on physical violence from patient and visitors (e.g., extreme crimes), while the situation of harassment and violence from colleagues is still unclear [24].

Furthermore, as our study was conducted mainly before 2020, the respiratory infectious disease was not in the top three priorities of the interviewees in both countries. During the COVID-19 outbreak, attention had been paid to the occupational health protection for HWs in China [29]. According to the official announcement by the National Health Commission of China, as of midnight on February 11, 2020, a total of 1,716 HWs had been infected by COVID-19, comprising 3.8% of the total infections in mainland China, six death cases of HWs were reported, accounting for 0.4% of the total fatalities [30]. Meanwhile, when facing the challenge of COVID-19, great concerns of occupational hazards of infectious disease were raised for HWs in the NHS [31].

Therefore, the setting of dynamic priorities of occupational health for HWs needs the strong support of sustainable surveillance among HWs with analytical evidences.

4.5. Tailored strategies for the priorities of occupational health of HWs

Alongside the priorities of occupational health for HWs, the health sector should be the role model in workplace health among all employees in the society so that good practice in the health sector can be replicated elsewhere. This principle has been emphasized and enhanced in the Healthy China 2030 strategy and reaches broader consensus during COVID-19 pandemic, working in stressful environments makes health workers more prone to errors, which can lead to patient harm [26]. Protection of HWs is not a cost but a fundamental investment to achieve the UN SDGs, strategies of occupational health for HWs are pillars of macro strategy of Universal Health Coverage.

In particular, decisive steps should be taken to break down the barriers in providing service of universal basic occupational health for HWs, along with a comprehensive management system of occupational health in the health sector. China has made remarkably progress in this issue, for instance, with the implementing of the national campaign of Security Hospital, by the end of 2016, police stations were set up at 85% of secondary and tertiary hospitals, more than 6,000 hospitals had equipped Internet-based emergency reporting system connecting to policy agencies directly [32]. During the COVID-19 outbreak in China, according to the emergency policy issued by three ministries, work-related insurance should be covered for the infection and death of COVID-19 among HWs and other directly related workers [33].

4.6. Human resources development for occupational health protection for HWs

Health human resources shortage might be a potential factor that undermines staff's health and safety. When we conducted interviews in both NHS and Chinese public health service, all of interviewees echoed the point that the shortage of HWs has become the critical risk to their health from varied occupational hazards. The previous study suggested a mechanism linking workload and workplace violence, HWs shortage may cause consequent overextended workloads, then the occurrence of inadequate communication with patients and their visitors led to more waiting time and lower quality of service than expected, thus increased the risk of violence toward HWs [24].

According to the WHO statistics, for the Skilled Health Professional Density per 10,000 population, density in the UK was 112.4 and the 22nd position among 53 countries in Europe; while the density in China was 31.5 and the 18th position among 28 countries in Asia Pacific [34]. The statistics suggested both countries have a shortage of its health workforce.

Inspections/crackdowns have a great influence on the effectiveness of occupational health protection for HWs; however, for the Chinese-relevant laws, there was no specific requirement about the professional human resources of occupational health for HWs. According to the national statistics in 2016, there were 2,567 occupational health check-up facilities with 51,521 professionals, 414 occupational diseases diagnosis facilities with 7,478 professionals, and 366 radiation technical service facilities with 3,670 professionals, comparing to the needs of diverse occupational health service for 776 million employed people in China, occupational health services were only available to a very small proportion of workers nationwide, including HWs [35].

A study on NHS implied that, human resources management (HRM) policies that promote the health and wellbeing of NHS staff can indeed curtail injury rate and work-related stress, injury rates increased sickness absence, damaged productivity and incurred higher medical legal fees for the NHS, the HRM practices of the NHS should pay particular attention to variations of work culture among various occupational groups [36].

4.7. Strengths and limitations

To our best knowledge, this is the first study on occupational health for HWs in China, with a unique policy framework as well as comparison with foreign country. From perspectives of laws, monitoring systems, priorities, and strategies, this article analyzed the situation in Chinese public health service, drew the lessons from the NHS England, and discussed the underline issues for further improvement.

Nevertheless, the study has several limitations. First, due to the limit of time and resources, the interviewees were convenient samples, primarily related to selection bias. Second, under the qualitative study in this article, theoretical saturation may not be fully reached, the results should be generalized cautiously, it was only exploration for further comprehensive research, for example, priorities should be identified with systematic review or/and empirical study. Third, the five categories of occupational hazards identified by the ILO/WHO HealthWISE do not cover lifestyle health problems among HWs, such as the priority of nutrition disorder and overweight in the UK; thereafter, we recommend Chinese health authority to focus on lifestyle problems (nutrition disorder and overweight, tobacco use, alcohol use) when necessary.

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Conflicts of interest

All authors have no conflicts of interest to declare.

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