




ORIGINAL ARTICLE

Changes over 10 years in the nursing workforce in Guangdong province, China: Three-wave multisite surveys

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Abstract

Aims: The study aimed to describe the changes in the nursing workforce in 2008–2018 in Guangdong province, China.

Background: A strong nursing workforce is important in the development of the health care system in China. However, whether the nursing workforce in China has improved is underexplored.

Methods: Three waves of surveys were conducted in hospitals in Guangdong province, China, in 2008, 2014 and 2018.

Findings: The proportion of less experienced nurses and nurses holding a bachelor's degree has increased. The hospital nurse-to-patient ratio did not change significantly. The work environment deteriorated from 2008 to 2014 and improved from 2014 to 2018. Nurse-perceived staffing adequacy and nurses participating in hospital administration were scored lowest. The nurse-physician relations declined from 2008 to 2018. Nurse satisfaction, retention and quality of care improved, while reduced personal accomplishment deteriorated.

Conclusion: The nursing workforce in Guangdong province, China, is young and highly educated. Nurse outcomes and quality of care have made progress from 2008 to 2018. Nurse staffing and burnout remain matters of concern.

Implications for nursing management: Strategies addressing nursing workforce issues in China include dealing with the nursing shortage, establishing pathways for nurses' participation in decision-making, increasing nurses' income and welfare, promoting recognition of nurses and improving the quality of care.

KEYWORDS

burnout, intention to leave, job satisfaction, quality of care, work environment

Jiali Liu and Xu Liu should be considered joint first author.

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1 | INTRODUCTION

The nursing workforce is an essential element of the health care system, and nurses have been recognized for their key roles in providing health care services and shaping health care systems (World Health Organization [WHO], 2016). Because nurses are the only professional caregivers at the patient's bedside around the clock, they are crucial to the improvement of health care service delivery and to the enhancement of patient satisfaction (Liu et al., 2016). A strong nursing workforce is essential in ensuring that nurses are working efficiently.

Although the ideal of a strong nursing workforce is shared by countries worldwide, China's priorities and strategies are set by its unique health care environment. A decade ago, the nursing workforce in China faced a severe shortage (only 12.5 nurses per 10,000 population). Because nurses are important resources in achieving health care goals, the Chinese government devoted intensive efforts to strengthening the nursing workforce in the past 10 years. Targets for hospital nurse staffing and for educational preparation were set to guide the recruitment of nurses. The National Health Commission of China (2016) stated that, by the end of 2020, the nurse-to-bed ratio should be $\geq 0.8:1$ in Level 3 hospitals and $\geq 0.6:1$ in Level 2 hospitals; the percentage of nurses with advanced diplomas or higher degrees should be $\geq 80\%$ in Level 3 hospitals and $\geq 60\%$ in Level 2 hospitals. To reduce nurse turnover, the National Health Commission of China (2011b) advocated building a healthy work environment for nurses, emphasizing safe work conditions, adequate resources, supportive management and harmonious working relationships. To optimize nurses' performance, the Chinese government initiated the High Quality Nursing Care programme in public hospitals nationwide (National Health Commission of China, 2011a). The programme aimed to shift nursing practices from disease-centred care to person-centred care, thereby maximizing the capacity of nurses to deliver high quality of care. In recent years, whether China is on the path to improving its nursing workforce remained understudied.

According to the national statistical data, the extent of the nursing workforce increased from 1.65 million in 2008, that is, 12.5 nurses per 10,000 population to 4.45 million in 2019, 31.7 nurses per 10,000 population (National Bureau of Statistics of China, 2020). Simultaneously, the educational preparation for nurses was upgraded. The proportion of nurses holding an advanced diploma or a bachelor's degree in nursing increased from one-third in 2008 to three-quarters in 2019 (National Bureau of Statistics of China, 2020). These national data suggest an improvement in the nursing workforce. However, nursing workforce management includes monitoring the workforce numbers, investing in retention, developing leadership and maximizing nurses' contribution (WHO, 2016). The size of the national nursing workforce and its educational preparation are insufficient to provide a comprehensive description of the changes in the nursing workforce. A thorough evaluation of the nursing workforce is required. Previous studies suggested that hospital nurse demographic characteristics, nurse staffing, nursing work environment, nurse job satisfaction, burnout, intention to leave and nurse-perceived quality of care are important indicators of the nursing workforce and that these

indicators are related to patient outcomes (Aiken et al., 2014). However, to the best of our knowledge, no studies in China have used these indicators to assess changes in the nursing workforce, thereby limiting the current understandings of the development of the nursing workforce in China.

To close these research gaps, we aimed to describe changes in nurse demographic characteristics, nurse staffing, nursing work environment, nurse job satisfaction, burnout, intention to leave and perceived quality of care from 2008 to 2018. Through comprehensive analysis, this study may provide empirical evidence for policy-making recommendations for future nursing workforce planning.

2 | METHODS

2.1 | Design, settings and participants

This study consisted of three waves of cross-sectional surveys, conducted in Guangdong province, China, from October to December 2008, December 2013 to August 2014 and July to December 2018. A multistage sampling strategy was used to select hospitals, units and nurses in three waves of studies (Liu et al., 2019; You et al., 2013). First, a list of hospitals in Guangdong province was obtained from the provincial Health Commission. According to the distribution of hospitals, quota sampling was used to select Level 2 (300–500 beds) and Level 3 (>500 beds) general hospitals from the provincial capital city and other regions across Guangdong province. Second, a list of medical or surgical units in each participating hospital was obtained, and random sampling was used to select at least three units from each hospital. Third, all registered nurses who delivered direct care to patients in the selected units were invited to participate in the study. Nurse managers and nurses who were not on duty during the survey were excluded. As these were multisite, large-scale surveys, the sample size was not calculated, but at least 30 nurses were recruited in each hospital to analyze the nursing workforce at the hospital level according to experience from previous studies (You et al., 2012). Finally, we investigated 70 units (38 medical units and 32 surgical units) in 21 hospitals (11 Level 3 hospitals and 10 Level 2 hospitals) and collected surveys from 831 nurses (valid response rate: 91.4%) in 2008. In 2014, 1560 nurse surveys from 58 medical units and 53 surgical units in 23 hospitals (12 Level 3 hospitals and 11 Level 2 hospitals) were collected (valid response rate: 93.4%). In 2018, 89 medical and 92 surgical units were selected from 19 Level 3 hospitals and 17 Level 2 hospitals. A total of 2518 valid responses were collected in 2018 (valid response rate: 92.5%).

2.2 | Measures

The China Nurse Survey, adapted from the Pennsylvania Registered Nurse Questionnaire (Florida version), was used to collect nurses' demographic characteristics, nurses' perceptions of work environments, job satisfaction, burnout, intention to leave and quality of care

(Clarke & Aiken, 2008; Liu et al., 2012). All multi-item scales in the China Nurse Survey showed acceptable internal consistency and construct validity in the 2008 and 2014 studies (Liu et al., 2012; Liu et al., 2019).

2.2.1 | Demographic characteristics

Nurses' demographic characteristics, including age, gender and highest nursing qualification, were collected.

2.2.2 | Nurse staffing

Nurse staffing was measured by hospital nurse-to-bed ratio, which was calculated using the total number of nurses in the hospital divided by the total number of available beds.

2.2.3 | Work environment

The work environment was measured using the Practice Environment Scale—Nursing Work Index (PES-NWI). The PES-NWI consists of 31 items covering five subscales (Lake, 2002). The PES-NWI is widely used in international studies and has been endorsed by the National Quality Forum of the United States (Aiken et al., 2014). The scale is a 4-point Likert scale, with responses ranging from *strongly disagree* (scored 1) to *strongly agree* (scored 4). Higher scores indicated a better work environment. In the 2018 study, the Cronbach's α for the PES-NWI was .82–.94, indicating relatively high internal consistency.

2.2.4 | Nurse outcomes

In this study, nurse outcomes included job satisfaction, burnout and intention to leave. Job satisfaction was measured using 10 independent items asking the nurses to report their perceptions of nursing as a career, their current job and aspects related to their job, that is, shift, autonomy at work, personal development, professional status, income, health welfare, pension benefits and financial supports for continuing education (Zhang et al., 2014). The rating anchors ranged from 1 (*very satisfied*) to 4 (*very dissatisfied*). Lower scores indicated higher satisfaction. In the analysis, the responses were divided into dichotomies as suggested in previous studies (Zhang et al., 2014). 'Somewhat dissatisfied' and 'very dissatisfied' were categorized as 'dissatisfied,' and 'moderately satisfied' and 'very satisfied' were categorized as 'satisfied.'

Burnout was measured with the Maslach Burnout Inventory—Human Service Survey (MBI-HSS). The MBI-HSS is a 22-item scale, including three subscales: emotional exhaustion (EE), depersonalization (DP) and personal accomplishment (PA) (Maslach et al., 2010). The nurses were asked to indicate how often they had experienced

the items, ranging from 0 (*never*) to 6 (*a few times a week*). Higher scores on the EE and DP subscales and lower scores on the PA subscale indicated higher burnout. Those who scored ≥ 27 , ≥ 10 and ≤ 33 on EE, DP and PA, respectively, were considered as high burnout on EE, DP and reduced PA (rPA) (Maslach et al., 2010). The MBI-HSS is used widely in studies and has been established as a reliable and valid tool (Poghosyan et al., 2009). In the 2018 study, Cronbach's α for the MBI-HSS subscales ranged from .79 to .88, indicating acceptable internal consistency.

Intention to leave was measured with a single item asking nurses, 'Will you stay in your current job for the next 12 months?' (Zhang et al., 2014). The response anchors were changed in three surveys to extend the range of the data. Nurses could answer 'yes' or 'no' in the 2008 survey, whereas they could answer 'yes' or 'not sure' or 'no' in the 2014 survey. In the 2018 survey, the responses were 'definitely not,' 'probably not,' 'not sure,' 'probably yes' and 'definitely yes.'

2.2.5 | Quality of care

Nurses were important sources of data on care delivery. The quality of care was measured with independent items asking about nurse-reported confidence in managers solving patients' problems in their unit effectively and about patients' ability to care for themselves after discharge (scored from 1 = 'not at all confident' to 4 = 'very confident'), nurse-perceived overall quality of care (scored from 1 = 'poor' to 4 = 'excellent') and patient safety (scored from 1 = 'failing' to 5 = 'excellent') (Agency for Healthcare Research and Quality, 2013; Liu et al., 2019). Higher scores indicated better quality of care. Nurses' confidence in nurse managers solving patients' problems and in patients' ability to care for themselves was dichotomized as 'not confident' (response as 'not at all confident' and 'somewhat confident') and 'confident' (response as 'very confident' and 'confident'; Liu et al., 2019). Nurse-perceived quality of care was used as a dichotomous variable in the study: 'poor' and 'fair' were classified as 'poor/fair' quality of care, and 'excellent' and 'good' were classified as 'excellent/good' quality of care (Liu et al., 2019). Patient safety was dichotomized as a 'poor/failing' category (response value 4–5) and 'excellent/very good/acceptable' category (response value 1–3) in this study (Agency for Healthcare Research and Quality, 2013).

2.3 | Data collection

A hard copy survey was used for the nurse survey collection in 2008 and 2014, as described in previous studies (Liu et al., 2019; You et al., 2013). In 2018, an online survey was used to collect data. The researchers visited selected units and asked nurse managers to report the number of nurses on duty in the next 7 days. This number was used as the number of nurses being invited to participate in the study. Then, the researchers introduced the study to nurses and posted an invitation and a unique quick response (QR) code in the nurses' station in each unit. Nurses could scan the QR code with the WeChat app on

their smartphones. They could then complete and submit the survey on their smartphones. Each nurse could only complete the survey once using their WeChat account. We asked the nurses not to share the QR code with others. Three days after the distribution, the researchers reminded and encouraged every nurse to participate in order to increase the response rate. The QR code became invalid 7 days after distribution. During the data collection, only one nurse who did not use WeChat reported a willingness to participate in the survey. We provided a hard copy survey to the nurse, and the completed paper survey was returned to the researchers on the day of distribution.

2.4 | Data analysis

Descriptive statistics were used to depict nurse demographic characteristics, nurse staffing, nursing work environments, nurse outcomes and perceived quality of care in hospitals. Differences between years in nurse staffing and nursing work environments were tested using one-way one-factor analysis of variance with least-significant difference post hoc analysis. Comparisons between years in the proportion of nurses' dissatisfaction with nursing and with current job, high burnout and perceived inferior quality of care were tested using the Chi-square test. Cases with missing data were excluded pair-wise from analyses. Statistical significance was set at $\alpha < .05$ (two-sided). All analyses were conducted using SPSS 22.0.

3 | RESULTS

As shown in Table 1, 831, 1560 and 2518 valid nurse surveys were collected in 2008, 2014 and 2018, respectively. Most nurses are female (99.5%, 98.9% and 98.5% in 2008, 2014 and 2018, respectively). The average age of nurses was less than 30 years and changed little among the three surveys. However, the average number of years

working as nurses was lower in 2014 (4 years) and in 2018 (5 years), compared with that in 2008 (7 years). The proportion of nurses who hold bachelor's degrees in nursing increased from 16.9% in 2008 to 47.4% in 2018. However, the proportion of nurses with postgraduate degrees remained fairly stable at less than 1%.

In 2018, the average hospital nurse-to-bed ratio was 0.65 for Level 2 hospitals and 0.63 for Level 3 hospitals. No significant differences were found in the hospital nurse-to-bed ratio among the three surveys (Table 2). In 2018, 60% of Level 2 hospitals and 19% of Level 3 hospitals reached national standards for hospital nurse staffing.

The nurse-perceived work environment differed significantly across the three surveys. The average score on the PES-NWI decreased from 2008 (3.14) to 2014 (3.07), then increased in 2018 (3.11) (Table 3). The dimensions of the nursing work environment, 'staffing and resource adequacy' and 'nurse participating in hospital affairs' continued to be scored lowest in the three surveys. The ratings for these two dimensions declined in 2014 and then increased to a relatively equal level in 2018, compared with the ratings in 2008. Although the score for 'collegial nurse-physician relations' was highest among the five dimensions, the ratings decreased from 2008 (3.39) to 2014 (3.26) and 2018 (3.24). The dimensions, 'Nurse manager ability, leadership and support' and 'nursing foundation for quality care' did not change significantly ($p > .05$).

The proportion of nurses who reported dissatisfaction with being a nurse, their current job and all aspects of the job declined significantly (Table 3). In 2018, around one-third of nurses were dissatisfied with being a nurse (36.2%) and with their current job (36.4%). In all three surveys, the four lowest-rated aspects were income, financial support for continuing education, welfare in pension and welfare in health care, all of which are financial-related. In 2018, the percentage of nurses who were at high burnout on the EE, DP and rPA subscales were 38.7%, 27.0% and 51.0%, respectively (Table 3). Changes in nurse burnout on EE and DP from 2008 to 2018 were not significant, whereas the percentage of nurses who reported high burnout on rPA was increased from 2008 (44.6%) to 2014 (54.9%) and 2018 (51.0%).

TABLE 1 Demographic characteristics for survey nurses in 2008, 2014 and 2018

Characteristics	2008 (N = 831)	2014 (N = 1560)	2018 (N = 2518)
Gender (female, %)	99.5	98.9	98.5
Age (years, median, IQR)	27, 24–32	26, 23–30	27, 24–30
Experience as a nurse (years, median, IQR)	7, 2–13	4, 2–9	5, 3–9
Education in nursing (%)			
Secondary diploma	16.6	11.7	10.8
Advanced diploma	66.4	47.7	41.6
Bachelor's degree	16.9	40.3	47.4
Postgraduate degree	0.1	0.3	0.2
Working in Level 3 hospital (%)	50.4	55.1	55.0
Working unit type (%)			
Medical unit	54.8	55.8	50.0
Surgical unit	45.2	44.2	50.0

Abbreviation: IQR, interquartile range.

TABLE 2 Comparison of hospital nurse-to-bed ratio from 2008 to 2018 (median [IQR], *n* [%])

	Level 2 hospitals			<i>F</i> (<i>p</i>)	Level 3 hospitals			<i>F</i> (<i>p</i>)
	2008 (<i>n</i> = 10)	2014 (<i>n</i> = 11)	2018 (<i>n</i> = 15)		2008 (<i>n</i> = 11)	2014 (<i>n</i> = 12)	2018 (<i>n</i> = 21)	
Nurse-to-bed ratio	0.63 (0.54–0.72)	0.67 (0.56–0.78)	0.65 (0.55–0.78)	0.46 (.637)	0.64 (0.58–0.77)	0.60 (0.52–0.74)	0.63 (0.58–0.74)	0.67 (.517)
<0.5	0 (0.0)	2 (18.2)	2 (13.3)		0 (0.0)	2 (16.7)	1 (4.8)	
0.5 ~ <0.6	4 (40.0)	2 (18.2)	4 (26.7)		3 (27.3)	4 (33.3)	6 (28.6)	
0.6 ~ <0.7	3 (30.0)	2 (18.2)	3 (20.0)		4 (36.4)	3 (25.0)	6 (28.6)	
0.7 ~ <0.8	3 (30.0)	3 (27.2)	4 (26.7)		2 (18.2)	1 (8.3)	4 (19.0)	
≥0.8	0 (0.0)	2 (18.2)	2 (13.3)		2 (18.2)	2 (16.7)	4 (19.0)	

Abbreviation: IQR, interquartile range.

TABLE 3 Changes in work environment, nurse outcomes and quality of care from 2008 to 2018

	2008 (<i>N</i> = 831)	2014 (<i>N</i> = 1560)	2018 (<i>N</i> = 2518)	<i>F</i> / <i>χ</i> ²	<i>p</i>
PES-NWI ($\bar{x} \pm s$) ^a	3.14 ± 0.69	3.07 ± 0.62	3.11 ± 0.58	3.35	.035
CNPR ($\bar{x} \pm s$) ^b	3.39 ± 0.69	3.26 ± 0.67	3.24 ± 0.64	14.60	<.001
SRA ($\bar{x} \pm s$) ^c	2.93 ± 0.89	2.85 ± 0.77	2.95 ± 0.71	7.69	<.001
NMLAS ($\bar{x} \pm s$)	3.16 ± 0.74	3.15 ± 0.67	3.14 ± 0.64	0.17	.845
NFQC ($\bar{x} \pm s$)	3.20 ± 0.62	3.18 ± 0.56	3.22 ± 0.54	2.53	.080
NPHA ($\bar{x} \pm s$) ^d	2.96 ± 0.87	2.91 ± 0.76	3.04 ± 0.68	14.04	<.001
Nurse dissatisfaction					
Nursing as a career (<i>n</i> , %)	473, 56.9	892, 58.3	912, 36.2	228.24	<.001
Current job (<i>n</i> , %)	438, 52.8	753, 49.2	917, 36.4	100.97	<.001
Income (<i>n</i> , %)	660, 79.3	1122, 72.6	1503, 59.7	142.87	<.001
Financial support for continuing education (<i>n</i> , %)	576, 73.3	988, 64.8	1135, 45.1	265.79	<.001
Welfare in pension (<i>n</i> , %)	483, 59.4	859, 56.9	991, 39.3	165.43	<.001
Welfare in health care (<i>n</i> , %)	504, 60.7	841, 54.8	963, 38.2	177.06	<.001
Professional status (<i>n</i> , %)	538, 64.8	773, 50.4	849, 33.7	278.60	<.001
Opportunity for promotion (<i>n</i> , %)	455, 54.9	608, 39.4	739, 29.4	181.22	<.001
Shift arrangement (<i>n</i> , %)	324, 39.0	445, 28.9	605, 24.0	70.25	<.001
Autonomy at work (<i>n</i> , %)	107, 12.9	168, 10.9	239, 9.5	8.07	.018
High burnout					
EE (<i>n</i> , %)	292, 37.6	609, 41.9	950, 38.7	5.37	.068
DP (<i>n</i> , %)	202, 25.9	448, 29.9	663, 27.0	5.46	.065
rPA (<i>n</i> , %)	342, 44.6	769, 54.9	1253, 51.0	20.82	<.001
Not confident in managers solving patient care problems (<i>n</i> , %)	422, 50.9	869, 51.7	813, 32.3	183.61	<.001
Not confident in patients' ability to care themselves after discharge (<i>n</i> , %)	368, 44.4	779, 50.5	878, 34.9	100.41	<.001
Poor/fair quality of care on unit (<i>n</i> , %)	299, 36.0	640, 41.6	807, 32.1	37.86	<.001
Poor/failing patient safety on unit (<i>n</i> , %)	41, 4.9	105, 6.7	71, 2.8	36.61	<.001

Abbreviations: CNPR, collegial nurse-physician relations; DP, depersonalization; EE, emotional exhaustion; NFQC, nursing foundation for quality care; NMLAS, nurse manager ability, leadership and support; NPHA, nurse participating in hospital affairs; PES-NWI, Practice Environment Scale–Nursing Work Index; rPA, reduced personal accomplishment; SRA, staffing and resource adequacy.

^aThe median of PES-NWI score was 3.08. Post hoc analysis showed significant differences in the PES-NWI scores between 2008 and 2014 and between 2014 and 2018.

^bPost hoc analysis showed significant differences in the CNPR scores between 2008 and 2018.

^cPost hoc analysis showed significant differences in the SRA scores between 2008 and 2014 and between 2014 and 2018.

^dPost hoc analysis showed significant differences in the NPHA scores between 2008 and 2018 and between 2014 and 2018.

Moreover, rPA remains the most prominent aspect of burnout among the three surveys. In 2008, 7.6% of nurses reported they intended to leave their job within the next 12 months, whereas 92.4% reported their willingness to stay. As the response anchors changed, the proportion of nurses reporting willingness to stay changed to 24.4%, and 68.5% of nurses were not sure about whether to leave in 2014. However, the proportion of nurses who intended to leave was relatively unchanged from 2008 (7.6%) to 2014 (7.1%). In the 2018 study, the percentage of nurses reporting probably or definitely leaving their job declined to 1.1%. The percentage of nurses reporting definitely staying in their current job was 36.2% in 2018, which was higher than for those reporting willingness to stay in 2014 (24.4%, Figure 1).

In 2018, approximately one-third of nurses reported a lack of confidence in managers solving patient care problems and in patients' ability to care for themselves after discharge. The percentage of nurses perceiving poor or fair quality of care was 32.1%, whereas the percentage of those perceiving poor/failing patient safety on their unit was 2.8%. The percentage of nurses who perceived inferior quality of care was significantly lower in 2018, compared with the percentages in 2008 and 2014 (Table 3).

4 | DISCUSSION

The study displays the comparison of nursing workforce changes in Guangdong province, China, in the past 10 years. The results indicate an improvement in nurse education preparation; no significant changes in the quantity of nurse staffing; a trend of deterioration from 2008 to 2014, then improvements from 2014 to 2018 for nursing work environments, nurse burnout and perceived quality of care; and a continuing reduction in job dissatisfaction and intention to leave. An understanding of the changes in the nursing workforce identified in our study could help to provide useful recommendations for the ongoing development of the nursing workforce and the nursing profession in China.

4.1 | Nurse demographics

During our observations, the proportion of less experienced nurses and nurses holding bachelor's degrees increased over the past 10 years. To meet the health care needs of the population, a great number of new graduates were absorbed into health care institutions, resulting in a younger and less experienced workforce. In our study, the average age of nurses was 27, and the average length of time working as nurses was around 5 years, suggesting a younger workforce compared with those reported in other countries (Japanese Nurse Association, 2015; Ryan et al., 2019). In response to the young nursing workforce, standardized in-service training for new nurses is required to enhance nurses' competencies (National Health Commission of China, 2016). Considerable progress has been made in the educational preparation of nurses. More than 80% of nurses had at least an advanced diploma, higher than the national standard (i.e., $\geq 80\%$ in Level 3 hospitals and $\geq 60\%$ in Level 2 hospitals). Almost half of the nurses in the 2018 survey had a bachelor's degree, a higher proportion than in 2008 (17.0%) and 2014 (40.6%). The upgrading of nurses' educational level is an important strategy in meeting the demands for high-quality nursing care (National Health Commission of China, 2011a). However, the proportion of nurses holding a master's degree remained low. In our study, less than 1% of nurses had a master's degree. According to national statistics, the percentage of nurses holding a master's degree (0.2%) was lower than for other health care professionals, such as physicians (13.1%) and pharmacologists (3.4%) (National Health Commission of China, 2019). Postgraduate programmes provide nurses with the competence to deliver advanced care and to participate in nursing research. Policies that encourage nurses to pursue higher education are suggested.

4.2 | Nurse staffing

The hospital nurse-to-bed ratio was approximately the same from 2008 to 2018. Only 9 out of 15 Level 2 hospitals and 4 out of 21 Level

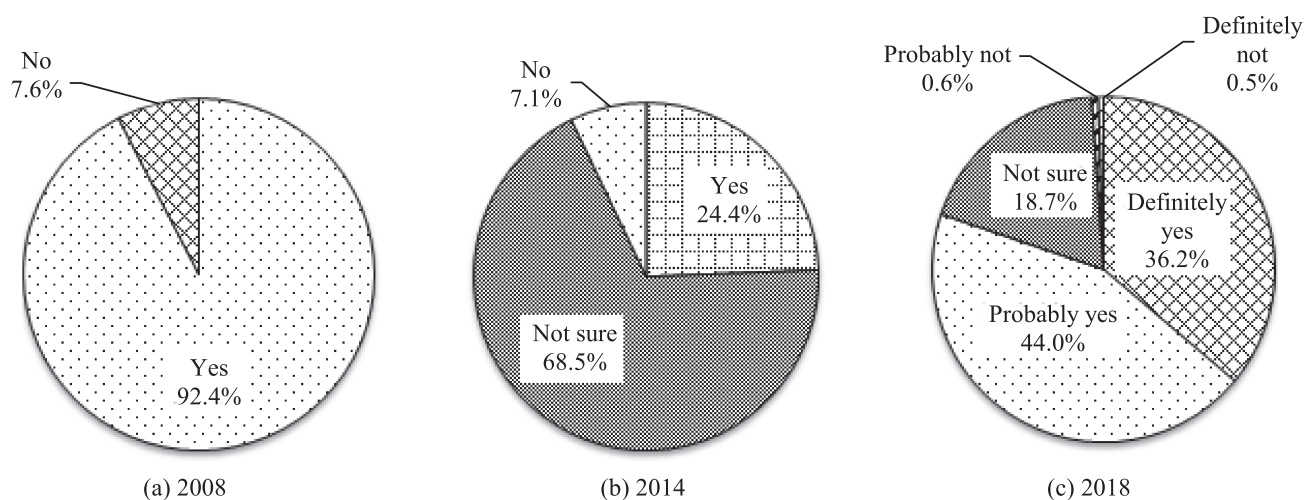


FIGURE 1 Nurses' intention to stay in their job in next 12 months in 2008–2018

3 hospitals reached the national standards of hospital nurse staffing in 2018. Although the national nursing stock has increased from 1.67 million in 2008 to 4.10 million in 2018 (National Health Commission of China, 2019), the health care needs of the population also increased. The total for hospital patient visits increased from 1.8 billion in 2008 to 3.6 billion in 2018, and the total number of hospital beds increased from 2.88 million in 2008 to 6.52 million in 2018 (National Health Commission of China, 2019). Therefore, the balance between supply and demand in the Chinese nursing workforce is still problematic. These findings of inadequate nurse staffing are consistent with previous studies reported in the United States, European countries and China, indicating a need for a general increase in hospital nurse staffing (Aiken et al., 2014; You et al., 2013).

4.3 | Work environment

Our results indicate a decline in nurses' ratings of work environments from 2008 to 2014 and a rebound from 2014 to 2018. Although the hospital nurse staffing ratio did not change significantly, nurse-perceived staffing adequacy decreased and then improved. Because the average number of years working as nurses had the same pattern of change as nurses' perception of staffing adequacy, which was 7 years in 2008, 4 years in 2014 (lowest) and then 5 years in 2018, we consider this could be one of the factors influencing nurses' perception of staffing adequacy. That is to say, the decrease in perceived staffing adequacy may be related to a less experienced workforce in 2014. The large proportion of new nurses may cause the workforce to perceive a heavier burden in providing high-quality care. In 2016, the Chinese government initiated the Healthy China 2030 Initiative, which proposed to apply internet technology to simplify the care delivery process (State Council of China, 2016). In recent years, along with the increase in work experience of the workforce, the hospital support system has also been strengthened. All these factors may contribute to the improvement in nurse-perceived workload and staffing adequacy. However, it is noteworthy that nurse staffing inadequacy remained the most concerning aspect of the work environment in all three surveys. This finding is consistent with previous studies in the United States, European countries and China (Aiken et al., 2014; You et al., 2013), suggesting that improvements in nurse staffing are needed. Our study indicates that nurses' low participation in hospital administration is another deficiency in the work environment. Nurses need to be provided with the essential skills required to be effective leaders. The International Council of Nurses and the Chinese Nurse Association have started Leadership for Change programmes in mainland China. These programmes are intended to help nurse leaders to develop leadership and coordination skills, together with the skills needed to facilitate changes and to influence policies (Chinese Nurse Association, 2017). Our study found an improvement in nurse participation in hospital administration from 2014 to 2018, possibly reflecting the positive effects of the training programmes. Hopefully, more nurses will be prepared for leadership positions, and nurses' voices will become more effective. Our study

found that nurse-physician collegial relations continued to decline from 2008 to 2018. This finding is consistent with a large-scale study conducted in 14 European countries (Aiken et al., 2014), indicating that nurse-physician relations needed to be improved. The lack of respect from physicians and the lack of teamwork are the most cited explanations for the poor cooperation between nurses and physicians (Zhang et al., 2014). Nursing has been developing quickly over recent decades, making it important to recognize the complementarity and interdependence of knowledge and skills that nursing brings to patient care (Chua et al., 2020). More efforts are needed to underline mutual respect and commitment to teamwork.

4.4 | Nurse outcomes and quality of care

Our study identified an improvement in career and job satisfaction and quality of care and a reduction in intention to leave from 2008 to 2018. Our results support policies implemented by the Chinese government to reduce nurse turnover, such as adopting a minimum level of nurse staffing as a requirement for hospital-level accreditation, building safe hospitals to avoid workplace violence, increasing income and improving nurses' well-being at work (Ministry of Human Resources and Social Security of China, 2017; National Health Commission of China, 2016). Although the government has advocated increasing the salary of health care professionals, the aspects associated with the highest levels of dissatisfaction were remuneration and welfare. These findings are consistent with previous studies in China and other countries (Akbari et al., 2020; Xu et al., 2016), suggesting that further efforts are needed to improve nurses' income. In our study, no significant changes in high burnout on EE and DP were observed from 2008 to 2018. However, around half of the nurses exhibited high burnout on rPA in 2014 and 2018, which was higher than those in 2008. Our results showed similar levels of EE and DP to levels in previous studies in North American, European and Middle East countries (Chemali et al., 2019), but Chinese nurses reported a higher burnout on rPA. These results align with those of a Chinese national survey, which found that Chinese nurses experienced moderate exhaustion and DP and highly rPA (Zhang et al., 2014). Current research attention to the rPA phenomenon is lacking. Therefore, further investigation into nurse burnout in the context of the Chinese health care system is needed.

The rebound in nurse-perceived quality of care in 2018 is a positive development. However, the portion of nurses reporting an unfavourable overall quality of care in our study in 2018 is higher than was reported in previous studies, 14.5% in Oman (al Sabei et al., 2020), 27% in Sweden (Lindqvist et al., 2015), 13.2% in Belgium (van Bogaert et al., 2017) and 16% in Thailand (Nantsupawat et al., 2016). Our results suggest that nurses showed fewer concerns about patient safety compared with the overall quality of care and patients' ability to care for themselves. This is consistent with previous studies indicating that necessary care being left undone is a more prevalent problem in care delivery than are mistakes or errors (Liu et al., 2019). More efforts are needed to improve the quality of care.

4.5 | Limitations

The study has certain limitations. First, longitudinal data were not available. This study aimed to compare the nursing workforce in Guangdong province at points in time from 2008 to 2018. Therefore, it was essential to achieve accurate data reflecting the nursing workforce at each point in time. Personal information about the nurses was not collected in all three surveys, thereby preventing follow-up. Second, nurse outcomes and quality of care were measured using nurse-reported data; objective data were not available. Researchers engaging in future studies are encouraged to combine objective data to reflect nurse and patient outcomes. Third, an online survey was used to collect data in 2018, unlike the hardcopy surveys used in 2008 and 2014. Different survey collection methods may cause differences in responses. However, our study showed almost the same valid response rates for three surveys.

4.6 | Implications for nursing management

The findings of this study suggest that the Chinese nursing workforce has made significant progress over the past 10 years. However, inadequate staffing, lack of participation in decision-making, unsatisfied income, reduced sense of PA and suboptimal quality of care are major concerns that need to be addressed. Therefore, investing more in dealing with the nursing shortage, establishing pathways for nurses to participate in decision-making, increasing nurses' income and welfare, promoting the recognition of the contribution of nurses and continuously improving quality of care may offer solutions to the nursing workforce issues in China.

5 | CONCLUSION

The study suggests that there have been improvements in education for nursing, nursing work environments, nurse outcomes and quality of care in the last 10 years in China. However, concerns regarding nurse staffing, nurse leadership, nurses' sense of fulfillment and the overall quality of care remain noteworthy. More efforts are needed to promote optimal outcomes for the nursing workforce in the future.

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CONFLICT OF INTEREST

The authors declare no competing interests.

ETHICS STATEMENT

The study was approved by the Ethics Committee of School of Nursing, Sun Yat-sen University (2019ZSLYEC-003).

DATA AVAILABILITY STATEMENT

Data available on request due to ethical considerations.

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REFERENCES

- Agency for Healthcare Research and Quality. (2013). Hospital survey on Patient Safety Culture. <http://www.ahrq.gov/qual/hospsurveydb/hospdbtaba9.htm>. (accessed Oct 1, 2020)
- Aiken, L. H., Sloane, D. M., Bruyneel, L., van den Heede, K., Griffiths, P., Busse, R., Diomidous, M., Kinnunen, J., Kozka, M., Lesaffre, E., McHugh, M., Moreno-Casbas, M. T., Rafferty, A. M., Schwendimann, R., Scott, A., Tishelman, C., van Achterberg, T., & Sermeus, W. (2014). Nurse staffing and education and hospital mortality in nine European countries: A retrospective observational study. *Lancet*, 383, 1824–1830. [https://doi.org/10.1016/S0140-6736\(13\)62631-8](https://doi.org/10.1016/S0140-6736(13)62631-8)
- Akbari, M., Bagheri, A., Fathollahi, A., & Darvish, M. (2020). Job satisfaction among nurses in Iran: Does gender matter? *Journal of Multidisciplinary Healthc*, 13, 71–78.
- al Sabei, S. D., Labrague, L. J., Miner Ross, A., Karkada, S., Albashayreh, A., al Masroori, F., & al Hashmi, N. (2020). Nursing work environment, turnover intention, job burnout, and quality of care: The moderating role of job satisfaction. *Journal of Nursing Scholarship*, 52, 95–104. <https://doi.org/10.1111/jnu.12528>
- Chemali, Z., Ezzeddine, F. L., Gelaye, B., Dossett, M., Salameh, J., Bizri, M., Bubale, B., & Fricchione, G. (2019). Burnout among healthcare providers in the complex environment of the Middle East: A systematic review. *BMC Public Health*, 19, 1337. <https://doi.org/10.1186/s12889-019-7713-1>
- Chinese Nurse Association. (2017). News report: The 1st Leadership for Change Program Completed Successfully in Beijing. <http://nurse.123jkb.cn>. (accessed 10 October 2020)
- Chua, W. L., Legido-Quigley, H., Jones, D., Hassan, N. B., Tee, A., & Liaw, S. Y. (2020). A call for better doctor-nurse collaboration: A qualitative study of the experiences of junior doctors and nurses in escalating care for deteriorating ward patients. *Australian Critical Care*, 33, 54–61. <https://doi.org/10.1016/j.aucc.2019.01.006>
- Clarke, S. P., & Aiken, L. H. (2008). An international hospital outcomes research agenda focused on nursing: Lessons from a decade of collaboration. *Journal of Clinical Nursing*, 17, 3317–3323. <https://doi.org/10.1111/j.1365-2702.2008.02638.x>
- Japanese Nursing Association. (2015) Nursing Statistics. [Date File]. <https://www.nurse.or.jp/jna/english/statistics/index.html> (accessed 10 March 2021).
- Lake, E. T. (2002). Development of the practice environment scale of the nursing work index. *Research in Nursing & Health*, 25, 176–188. <https://doi.org/10.1002/nur.10032>
- Lindqvist, R., SmedsAlenius, L., Griffiths, P., Runesdotter, S., & Tishelman, C. (2015). Structural characteristics of hospitals and nurse-reported care quality, work environment, burnout and leaving intentions. *Journal of Nursing Management*, 23, 263–274.
- Liu, J. L., You, L. M., Zheng, J., Ross, A. M., & Liu, K. (2016). Effects of work environment on quality of care in ICUs: A multisite survey in China. *Journal of Nursing Care Quality*, 31, E1–E8. <https://doi.org/10.1097/NCQ.0000000000000160>
- Liu, J. L., Zheng, J., Liu, K., Liu, X., Wu, Y., Wang, J., & You, L. (2019). Workplace violence against nurses, job satisfaction, burnout, and patient safety in Chinese hospitals. *Nursing Outlook*, 67, 558–566. <https://doi.org/10.1016/j.outlook.2019.04.006>

- Liu, K., You, L. M., Chen, S. X., Hao, Y. T., Zhu, X. W., Zhang, L. F., & Aiken, L. H. (2012). The relationship between hospital work environment and nurse outcomes in Guangdong, China: A nurse questionnaire survey. *Journal of Clinical Nursing*, 21, 1476–1485. <https://doi.org/10.1111/j.1365-2702.2011.03991.x>
- Maslach, C., Jackson, S. E., & Leiter, M. (2010). *Maslach Burnout Inventory Manual* (3rd ed.). Mind Garden, Inc.
- Ministry of Human Resources and Social Security of China. (2017). Guidance on the pilot of salary reform in public hospitals. <http://www.mohrss.gov.cn>. (accessed 10 October 2020)
- Nantsupawat, A., Nantsupawat, R., Kunavittikul, W., Turale, S., & Poghosyan, L. (2016). Nurse burnout, nurse-reported quality of care, and patient outcomes in Thai hospitals. *Journal of Nursing Scholarship*, 48, 83–90. <https://doi.org/10.1111/jnu.12187>
- National Bureau of Statistics of China. (2020). *China Statistic Yearbook 2019*. National Bureau of Statistics of China 2019. <http://www.stats.gov.cn/tjsj/ndsj/2019/indexch.htm>. (accessed Oct 1, 2020)
- National Health Commission of China (2011a). The Plan of Generalization of High Quality Care Program in 2011. www.nhc.gov.cn. (accessed Oct 1, 2020)
- National Health Commission of China. (2011b). The Mid-Term and Long-Term Development Planning for Medical and Health Personnel (2011–2020). www.nhc.gov.cn. (accessed Oct 1, 2020)
- National Health Commission of China. (2016). The Blueprint for Nursing Development in China (Year 2016–2020). www.nhc.gov.cn. (accessed Oct 1, 2020)
- National Health Commission of China. (2019). Healthcare personnel. In *China Health Statistical Yearbook 2019* (pp. 120–131). Peking Union Medical College.
- Poghosyan, L., Aiken, L. H., & Sloane, D. M. (2009). Factor structure of the Maslach burnout inventory: An analysis of data from large scale cross-sectional surveys of nurses from eight countries. *International Journal of Nursing Studies*, 46, 894–902. <https://doi.org/10.1016/j.ijnurstu.2009.03.004>
- Ryan, C., Bergin, M., White, M., & Wells, J. S. G. (2019). Ageing in the nursing workforce—A global challenge in an Irish context. *International Nursing Review*, 66, 157–164. <https://doi.org/10.1111/inr.12482>
- State Council of China. (2016). Healthy China 2030 Initiative. <http://www.gov.cn>. (accessed May 1, 2021).
- van Bogaert, P., Peremans, L., van Heusden, D., Verspuy, M., Kureckova, V., van de Cruys, Z., & Franck, E. (2017). Predictors of burnout, work engagement and nurse reported job outcomes and quality of care: A mixed method study. *BMC Nursing*, 16, 5. <https://doi.org/10.1186/s12912-016-0200-4>
- World Health Organization. (2016). Global strategic directions for strengthening nursing and midwifery 2016–2020. https://www.who.int/hrh/nursing_midwifery/glob-strategic-midwifery2016-2020_EN.pdf. (accessed Oct 1, 2020)
- Xu, Y., Wu, Y., Zhang, Y., & Ma, R. (2016). Investigation of nursing work status in Chinese hospitals. *Chinese Journal of Nursing*, 51, 947–950. (in Chinese)
- You, L. M., Aiken, L. H., Sloane, D. M., Liu, K., He, G. P., Hu, Y., Jiang, X. L., Li, X. H., Li, X. M., Liu, H. P., Shang, S. M., Kutney-Lee, A., & Sermeus, W. (2013). Hospital nursing, care quality, and patient satisfaction: Cross-sectional surveys of nurses and patients in hospitals in China and Europe. *International Journal of Nursing Studies*, 50, 154–161. <https://doi.org/10.1016/j.ijnurstu.2012.05.003>
- You, L. M., Liu, K., Zhu, X. W., Zhang, L. F., Zheng, J., & Bu, X. Q. (2012). Hospital nursing workforce research in China: Design and methods. *Journal of Nurses Training*, 27, 2026–2028. (in Chinese)
- Zhang, L. F., You, L. M., Liu, K., Zheng, J., Fang, J. B., Lu, M. M., Lv, A. L., Ma, W. G., Wang, J., Wang, S. H., Wu, X., Zhu, X. W., & Bu, X. Q. (2014). The association of Chinese hospital work environment with nurse burnout, job satisfaction, and intention to leave. *Nursing Outlook*, 62, 128–137. <https://doi.org/10.1016/j.outlook.2013.10.010>

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