Turnover intention and related factors among resident physicians in China under the standardised residency training programme: a cross-sectional survey

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ABSTRACT

Objectives This study aimed at examining the extent of turnover intention among the Chinese resident physicians who entered the newly established national standardised residency training programme (SRTP), and exploring factors associated with their turnover intention.

Design Cross-sectional survey.

Setting Ten institutions from five geographical areas in China.

Methods 1414 residents were surveyed using paper-based questionnaires and scales regarding their demographics, work situation, attitudes towards SRTP, job satisfaction, psychological resilience, burnout and turnover intention in 2017. The turnover intention was described and compared between categorical groups. Linear regressions were used to select the factors associated with turnover intention. The structural equation model was used to capture the potential mediating effects.

Results The mean turnover intention score was 12.45 (SD=4.47). Nearly half (47.87%) of the residents had a high and very high level of turnover intention. Psychological resilience (β=0.066), burnout (β=0.141) and job satisfaction (β=0.022) were positively associated with turnover intention, while specialty (β=-0.135), year of training (β=-0.687), career in medicine (β=-2.191), necessity of training (β=-0.695) and satisfaction with income (β=-1.215) had negative associations with turnover intention. Working hours and nightshift interval indirectly were associated with turnover intention through the mediating effects of burnout. Career in medicine, necessity of training, satisfaction with income, and psychological resilience showed direct effects and indirect effects on turnover intention through burnout and job satisfaction as mediators.

Conclusions The turnover intention among Chinese residents was prevalent and unignorable. Burnout was the major contributing factor, while year of training and positive attitudes towards training were protective factors. Burnout and job satisfaction also served as mediators. Interventions targeting these factors should be incorporated in the training programmes to keep a prosperous physician workforce.

Strengths and limitations of this study

- The study was the first to report the turnover intention among Chinese residents from all specialties under the newly established standardised residency training programmes in 10 institutions.
- Multiple methodologies including linear regressions and structural equation model were used to select the factors associated with turnover intention and capture potential mediating effects.
- Data were self-reported and might suffer from recall bias.
- Due to the cross-sectional study design, the effects only implied associations rather than causalities.
- It was unclear whether our sample differed from the national population, therefore the results should be interpreted and generalised with caution.

INTRODUCTION

China’s standardised residency training programme (SRTP) was designed to reduce the inequity of services offered in different levels of practice through standardising postgraduate training. It was initiated in Shanghai in 2010 and compulsorily implemented in every province as a national policy in China since 2015. The training quality of young doctors has been greatly promoted because the programme established standardised evaluation details to ensure that residents who graduated from different programmes have achieved the same and measurable knowledge and abilities.1 2 The training standards for each specialty included training objectives, rotation length requirements, training content and reference material. Trainees must complete annual evaluations and final examination for SRTP, and pass the national medical certificate examination to get the completion certification of the SRTP.3
Though standardisation improves the quality of training, SRTP residents are facing more challenges than what has been commonly reported, including overwhelming workload and pressure, intense doctor–patient relationships and diminished professional self-identity, which could all lead to turnover. They need to overcome longer training time, higher requirements and evaluation standards, while they might receive insufficient income and suffer from job uncertainty. Before the policy, medical graduates received residency training managed by their employed hospitals with varied lengths and requirements. Most of those residency programmes were permanent contract, meaning they were secured with jobs within their training hospitals. The SRTP sites are usually located in tertiary hospitals where the patient volume and workload are relatively heavy. SRTP residents in many provinces are under temporary contract and must seek new employment after training, often in other hospitals. As a result of these new changes at the beginning of their professional career, burnout symptoms, job dissatisfaction, negative views towards training and turnover have been observed among SRTP residents, hinting that their attrition might be severer than estimated. The reasons might be different from physicians who were official employees of the hospitals, due to the change of employment status and social identities that may cause diminish of career commitment and the intent to quit the programme. Therefore, it is essential to know the situation of turnover among these SRTP residents and find out the reasons and factors behind, before effective and timely interventions can be designed. Otherwise, China’s healthcare system may suffer from the loss of young promising physicians due to the prolonged training time resulting from the implementation of SRTP.

Physicians’ turnover happens when physicians voluntarily quit their jobs. Researchers in western countries have been studying residents’ attrition phenomenon for years due to the long existence of their residency training programmes. The reported annual attrition rates varied by the residents of different specialties, from the lowest of 1.5% in emergency medicine to the highest of 7.9% in psychiatry in the USA. Turnover intention, however, was considered to precede turnover behaviour in many models, such as March and Simon’s participant determination model, and Price and Mueller’s loss motivation model. It was confirmed as the principal cognitive precursor and predictor of turnover behaviour, and also affects job performance and productivity. It could better reflect the real internal organisational management level compared with turnover behaviour, which was easily affected by other external factors (such as availability of the external job positions). Hence, at the beginning stage of SRTP when there were not enough data on turnover, gauging the turnover intentions among SRTP residents, rather than observing the real turnover behaviours, could help in better estimating their propensity to leave.

There are many reasons causing turnover intention among medical professionals, and previous studies varied in the selection of factors. From the industrial viewpoint, the medical system, occupational environment, professional development, doctor–patient relationship and external job opportunities all contribute to turnover intention. Individual factors that were often examined consist of demographics such as age, gender, marital status, work ability, and work-related factors such as working hours, salary, social security, job stress, job autonomy, job satisfaction, and burnout. Burnout and job dissatisfaction were the most commonly cited work-related factors that were considered to affect turnover intention in most literature. However, modelling the relationships among burnout, job satisfaction and turnover intention has been complex in previous literature, as many factors were found to be simultaneously associated with them. Job and role stress, duration of employment, working hours, work environment, self-efficacy and financial worries were proven to be associated with work satisfaction and burnout, which were also proven to be predicted factors for turnover intention.

Besides, some researchers have treated job satisfaction as the intermediary variable between burnout and turnover intention, while some proved the mediating effect of burnout on turnover. The turnover intention was also noted to be affected by age, education level, monthly income, hire form, and night shift directly or through the mediators of satisfaction and burnout. Hence, potential mediating effects from satisfaction and burnout should be considered when examining their relationships with turnover intention.

Psychological resilience is an inherent personal trait that helps individuals to adapt and overcome adversity and stress, which can be improved through external cultivation and training. Studies have shown that people with higher psychological resilience or emotional intelligence were more willing to get engaged in work, hold positive attitudes towards stressful events and experience less burnout. Organisation commitment was another commonly considered factor that contributes to turnover intention. However, most standardised trained residents were not permanently contracted with the hospitals they were trained in. Therefore, rather than measuring their commitment to the organisation, we suspected that their attitudes towards the career and the newly established training programme might be more likely to contribute to their intention to leave, thus variables regarding their attitudes were intentionally constructed in our self-administrated survey.

There have been limited studies on turnover intention conducted among Chinese standardised trained residents,
while most literature focused on physicians with high risks of leaving their jobs, such as general practitioners or physicians in tertiary hospitals. A nationwide online survey found out 18.7% of the psychiatry residents had an intention to quit residency. Another study conducted in a single tertiary hospital in central China reported their physicians in tertiary hospitals. A nationwide online survey was conducted through a pilot study with 20 residents from one institution, and all self-designed items were also asked, including their ‘satisfaction with income’ (dissatisfied, neutral, satisfied), whether they originally chose ‘career in medicine’ (yes/no) and their thoughts on the ‘necessity of training’ (unnecessary/neutral/necessary).

The turnover intention was measured by the validated Turnover Intention Scale. All six items used a 5-point Likert-type scale ranging from 0 (never) to 4 (always), measuring three dimensions, including the possibility of quitting from the current job, the motivation of finding other jobs and the possibility of getting new jobs. The total scores were calculated, which ranged from 0 to 24 with a higher score indicating higher turnover intention. Participants were also categorised into four groups according to the degree of turnover intention, including low (0–6), moderate (7–12), high (13–18) and very high (19–24) according to a previous study, to show the distribution of the scores by degree. Residents were also asked to choose the frequency (never, sometimes or often) of thinking about turnover, and choose the major reason for quitting their jobs from five provided reasons or fill in their personalised answers.

Job satisfaction was measured using the short version of Minnesota Satisfaction Questionnaire, validated in the Chinese population. This questionnaire also used 5-point Likert-type items, ranging from 1 (very dissatisfied) to 5 (very satisfied), measuring intrinsic (12 items) and extrinsic satisfaction (6 items) and general satisfaction (2 items). The total scores ranged from 20 to 100 with a higher score indicating higher job satisfaction.
Psychological resilience was measured using the Chinese version of Connor-Davidson Resilience Scale, validated among the Chinese population. A total of 25 positive-toned items ranging from 1 (not at all) to 5 (almost always like that), measured three dimensions: optimism, tenacity and strength. The total scores ranged from 25 to 125 with a higher score indicating higher resilience.

Burnout was measured using the Chinese version of the Maslach Burnout Inventory-Human Services Survey, which has been validated among Chinese health professionals. This survey includes 22 items of 7-point Likert-type scales ranging from 0 (never) to 6 (every day) and measuring three dimensions: emotional exhaustion, depersonalisation and personal accomplishment. Except for personal accomplishment items, the others were negatively toned. The personal accomplishment score was reversely calculated into reduced personal accomplishment so that the scores of the three dimensions remain the same direction. The total score was calculated by adding three subscale scores, ranging from 0 to 132 points, with a higher score indicating a higher degree of burnout. The reliability of the measures was tested via Cronbach’s alpha coefficient. The score distributions and Cronbach’s alpha coefficients of all the scales were acceptable (α>0.80) and reported in online supplemental appendix 2.

Statistical analyses

Descriptive analyses were performed to describe the demographics, training characteristics and attitudes towards the training of all the participants. The mean turnover intention score was calculated and categorically towards the training of all the participants. The mean turnover intention score of all the participants was 12.45 (SD=4.47) (table 2). When categorical turnover intention score was found significantly lower for residents from <50 000 RMB annual income (75.60%). Around half of them were in the third year of training (48.16%), having a night-shift interval longer than 7 days (56.08%) and working 45–54 hours per week (50.50%). Participants were from 16 different specialities, but they were regrouped into five categories, with internal medicine residents consisting of the largest portion (29.21%), followed by surgery residents (20.30%). Only 36.99% of them originally planned a career in medicine. Most of them (50.14%) thought the training was necessary, but a great number of them were dissatisfied with the income (74.26%).

RESULTS

Demographics, training characteristics and attitudes towards the training among participants

A total of 1743 residents were contacted and distributed the questionnaire, and 1427 returned the survey (response rate: 81.9%). Among the 1427 sampled residents, 1414 completed all questions and were enrolled in our analyses (questionnaire-reclaiming efficiency: 99.08%). The demographic characteristics of the participated residents and the turnover intention score according to demographic groups were shown in table 1. Most of the participants were 24–28 years old (67.26%), female (59.48%), single/divorced (84.79%), holding a bachelor’s degree (67.40%) and having less than 50 000 RMB annual income (75.60%). Around half of them were in the third year of training (48.16%), having a night-shift interval longer than 7 days (56.08%) and working 45–54 hours per week (50.50%). Participants were from 16 different specialities, but they were regrouped into five categories, with internal medicine residents consisting of the largest portion (29.21%), followed by surgery residents (20.30%). Only 36.99% of them originally planned a career in medicine. Most of them (50.14%) thought the training was necessary, but a great number of them were dissatisfied with the income (74.26%).

Prevalence of the turnover intention among participants

The mean total score of the turnover intention of all the participants was 12.45 (SD=4.47) (table 2). When categorising turnover intention score by its degree, nearly half (47.87%) of the residents had a high (39.60%) and very high (8.27%) level of turnover intention. When asked about the frequency of thinking about turnover, 51.63% of the residents reported ‘sometimes’, and 11.46% of the residents reported ‘often’. The most selected major reason for turnover was ‘low income’ (46.11%), followed by ‘heavy work stress’ (21.15%) (table 3). Turnover intention score was found significantly lower for residents from 50 000 to 100 000 income group when compared with those from <50 000 RMB income group (p=0.003), lower for residents at the third year of training when compared with those at the first year of training (p=0.01), lower for
## Table 1 Demographics, training characteristics and attitudes towards the training of sample residents, and comparing turnover intention score across categorical groups (n=1414)

| Turnover intention score | N   | %    | Mean (SD) | F     | P value | t      | P value |
|--------------------------|-----|------|-----------|-------|---------|--------|---------|
| Age group                |     |      |           | 1.78  | 0.16    |        |         |
| <24                      | 282 | 19.94| 12.00 (4.73)|       |         |        |         |
| 24–28                    | 951 | 67.26| 12.53 (4.40)|       |         |        |         |
| >28                      | 181 | 12.80| 12.63 (4.20)|       |         |        |         |
| Gender                   |     |      |           |       |         | -0.4   | 0.668   |
| Male                     | 573 | 40.52| 12.38 (4.57)|       |         |        |         |
| Female                   | 841 | 59.48| 12.48 (4.37)|       |         |        |         |
| Marital status           |     |      |           | -0.7  | 0.47    |        |         |
| Single/divorced          | 1199| 84.79| 12.40 (4.48)|       |         |        |         |
| Married                  | 215 | 15.21| 12.64 (4.28)|       |         |        |         |
| Education                |     |      |           | 2.15  | 0.11    |        |         |
| Bachelor                 | 953 | 67.40| 12.30 (4.47)|       |         |        |         |
| Master                   | 388 | 27.44| 12.62 (4.34)|       |         |        |         |
| Doctor                   | 73  | 5.16 | 13.30 (4.60)|       |         |        |         |
| Annual income level      |     |      |           | 6.15  | <0.001  |        |         |
| <50 000 RMB              | 1069| 75.60| 12.60 (4.51)|       |         | Ref    |         |
| 50–100 000 RMB           | 319 | 22.56| 11.76 (4.12)| 3.01  | 0.003   |        |         |
| >100 000 RMB             | 26  | 1.84 | 14.00 (5.05)| -1.6  | 0.12    |        |         |
| Year of training         |     |      |           | 9.72  | <0.001  |        |         |
| 1                        | 145 | 10.25| 12.85 (4.03)| Ref   |         |        |         |
| 2                        | 588 | 41.58| 12.96 (4.41)| -0.3  | 0.78    |        |         |
| 3                        | 681 | 48.16| 11.90 (4.51)| 2.34  | 0.01    |        |         |
| Specialty                |     |      |           | 3.28  | 0.01    |        |         |
| Internal medicine        | 413 | 29.21| 12.87 (4.59)| Ref   |         |        |         |
| Surgery                  | 287 | 20.30| 12.32 (4.59)| 1.56  | 0.12    |        |         |
| Gynaecology & obstetrics, general medicine and paediatrics | 244 | 17.26| 11.72 (3.75)| 3.31  | 0.001   |        |         |
| Neurology, psychiatry, emergency and anaesthesiology | 203 | 14.36| 12.87 (4.66)| -0.01 | 0.99    |        |         |
| Others                   | 267 | 18.88| 12.22 (4.41)| 1.83  | 0.07    |        |         |
| Nightshift interval      |     |      |           | 0.02  |         |        |         |
| <7 days                  | 621 | 43.92| 12.74 (4.64)|       |         |        |         |
| ≥7 days                  | 793 | 56.08| 12.20 (4.28)|       |         |        |         |
| Working hours            |     |      |           | 7.26  | <0.001  |        |         |
| <45 hours/week           | 499 | 35.29| 11.90 (4.33)| Ref   |         |        |         |
| 45–54 hours/week         | 714 | 50.50| 12.60 (4.45)| -2.7  | 0.007   |        |         |
| >54 hours/week           | 201 | 14.21| 13.22 (4.61)| -3.6  | <0.001  |        |         |
| Career in medicine       |     |      |           | 9.43  | <0.001  |        |         |
| No                       | 891 | 63.01| 13.27 (4.29)|       |         |        |         |
| Yes                      | 523 | 36.99| 11.02 (4.37)|       |         |        |         |
| Necessity of training    |     |      |           | 14.8  | <0.001  |        |         |
| Unnecessary              | 257 | 18.18| 13.41 (4.37)| Ref   |         |        |         |
| Neutral                  | 448 | 31.68| 12.84 (4.32)| 1.67  | 0.1     |        |         |
| Necessary                | 709 | 50.14| 11.83 (4.47)| 4.87  | <0.001  |        |         |
| Satisfaction with income |     |      |           | 24.6  | <0.001  |        |         |

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residents from gynaecology and obstetrics, general medicine and paediatrics when compared with internal medicine residents as reference (p=0.001), lower for residents with longer (≥7 days) nightshift interval (p=0.02), lower for residents who planned a career in medicine (p<0.001), lower for residents who thought the training was necessary when comparing with those who hold a negative view (p<0.001), and lower for residents who felt neutral or satisfied with their income when comparing with those dissatisfied residents (both p<0.001). Compared with residents who worked for <45 hours per week, those who worked for 45–54 hours per week (p=0.007) and >54 hours per week (p<0.001) had a significant higher turnover intention (table 1).

Factors associated with turnover intention

Psychological resilience and burnout were positively associated with turnover intention (table 2) in Pearson’s correlation tests. Univariate and multiple linear regression results were shown in table 4. Annual income level, nightshift interval and working hours were significant in univariate analyses but were insignificant in both multiple linear models. The year of training, specialty, career in medicine, necessity of training, satisfaction with income, psychological resilience and burnout were selected as significant factors for turnover intention (table 4). The VIF values for multiple linear regressions were all below 5 (online supplemental appendix 2), indicating no severe collinearity issue existed. In sensitivity analyses using logistic regressions, similar factors were selected, except for necessity of training (online supplemental appendix 3).

SEM testified the existence of mediating effects from burnout and job satisfaction, significant paths on pathway C were gradually added according to modification indexes. The final model was fitted and standardised path coefficients were displayed in figure 2, and the total effect of each factor on turnover intention was calculated in table 5. Working hours (β=0.284), psychological resilience (β=0.066), burnout (β=0.141) and job satisfaction (β=0.022) showed positive effects on turnover intention, while nightshift interval (β=−0.330), specialty (β=−0.135), year of training (β=−0.687), career in medicine (β=−2.191), necessity of training (β=−0.695) and satisfaction with income (β=−1.215) had negative effects on turnover intention. Among these factors, the effects from working hours and nightshift interval were indirect through the mediating effects of burnout. Career in medicine, necessity of training, satisfaction with income, and psychological resilience showed direct effects and indirect effects on turnover intention through burnout and job satisfaction as mediators. The current SEM explained 70.5% of the total variance of turnover intention (coefficient of determination: 0.705), which was higher than the linear regression (R 2 value: 36.0%).

**DISCUSSIONS**

**Turnover intention among Chinese residents of SRTP**

This was the first multi-institutional study that investigated the turnover intention of the standardised trained residents from all specialties that entered the national SRTP. The mean turnover intention score was 12.45 (SD=4.47) among sampled Chinese residents. Nearly half (47.87%) of them were classified into ‘high’ and ‘very high’ turnover intention level, and 11.46% of them ‘often’ thought
Table 3 Prevalence of turnover intention by its degree, frequency and major reason (n=1414)

| Turnover intention | N   | %    |
|-------------------|-----|------|
| **Degree**        |     |      |
| Low (0–5)         | 144 | 10.18|
| Moderate (6–12)   | 593 | 41.94|
| High (13–18)      | 560 | 39.60|
| Very high (19–24) | 117 | 8.27 |
| **Frequency**     |     |      |
| Never             | 522 | 36.92|
| Sometimes         | 730 | 51.63|
| Often             | 162 | 11.46|
| **Major reason**  |     |      |
| Low income        | 652 | 46.11|
| Heavy work stress | 299 | 21.15|
| Low personal accomplishment | 120 | 8.49 |
| Disrespect        | 112 | 7.92 |
| Tense doctor–patient relationship | 168 | 11.88|
| Others            | 63  | 4.46 |

about quitting. The prevalence of high turnover intention among SRTP trainees (47.87%) was higher in our sample than that among residents in one teaching hospital in central China (37.8%).\(^{35}\) and higher than that among psychiatry residents from a national sample (18.7%).\(^{42}\) Compared with other Chinese physician populations, the average turnover intention score was lower than it was reported for general practitioners in Hubei (15.40, SD=3.43).\(^{14}\) The percentage of physicians with high turnover intention was similar to that for village doctors in Shandong (46.9%),\(^{43}\) but higher than that for physicians in tertiary hospitals (20.5%).\(^{44}\) and for rural health workers from 11 western provinces in China (29.1%).\(^{45}\) When comparing internationally, the percentage was higher than that among general surgery residents in Canada (32.0%)\(^ {46}\) and in the USA (20.0%),\(^ {47}\) and general internal medicine residents in Switzerland (21.0%).\(^ {48}\) Though the percentage-wise prevalence seemed to be higher for our sample than other physician populations, these studies differed in methodology and study period, which could compromise the direct comparability. ‘Low income’ was the most selected (46.11%) major reason chosen for turnover, which was unsurprising given that 75.60% of residents reported annual income level less than 50 000 RMB. Though Chinese residents usually do not have a huge financial burden coming from the student loan,\(^ {47}\) their annual income was uncompetitive with other entry-level professions. Moreover, SRTP residents were paid with a relatively lower level of salary and bonus than the residents with permanent contract before the implementation of SRTP, which may be the greatest obstacle for medical graduates to enter and stay through the programme. Our study showed half of the residents (50.50%) worked 45~54 hours per week, 14.21% worked more than 54 hours per week and 43.92% of them had a nightshift interval less than 7 days. ‘Heavy work stress’ was the second most selected reason, which revealed the fact that some trainees felt overwhelmed by the tasks and workload allocated to them. As longer working hours and shorter nightshift intervals showed an indirect effect on turnover intention through burnout, adjusting residents’ workload to prevent burnout may indirectly lower turnover intention.

Factors for turnover intention

Multiple methodologies repeatedly identified the similar factors associated with the turnover intentions among the sampled residents. Variables such as age, gender, marital status, education and annual income level were not associated with turnover intention in any of the models, though they were controlled in the multiple linear regression (table 4, model 2) and sensitivity analysis using multiple logistic regression (online supplemental appendix 3, model 4). Though being residents of surgery, gynaecology and obstetrics, general medicine, paediatrics and other specialties was associated with lower turnover intention, this could only suggest that specialty was confounding the turnover intention, as different grouping strategies could lead to different results. A previous study for physicians in tertiary hospitals in China also found the intention to leave was different among different specialties.\(^ {44}\) It could be explained by the fact that the training intensity and requirements, the working environment and the doctor–patient relationship were different in different specialties, which inspired further thorough investigation.

Protective factors identified in our study included the year of training, career in medicine, necessity of training and satisfaction with income. Our results indicated that being at the third year of training was associated with lower turnover intention, and the year of training had direct negative effects on turnover intention. These results were consistent with a study conducted in the USA that found residents were less likely to experience attrition later in residency.\(^ {49}\) It could be possibly explained by sunk cost effect, that trainees at their later year of training were near the end of the programme so that turnover would cost them more than finishing the programme. The three attitude variables toned positive were significantly associated with lower turnover intention, which was consistent with our hypothesis (H1). Unsurprisingly, the residents would have lower turnover intention scores if they were originally planned a career in medicine, believed the residency to be necessary and with higher satisfaction towards income. It is worth noting that it was the satisfaction of income, instead of the income level, that was proven to be related to turnover intention. Plus, these three factors were also proven to be indirectly associated with turnover intention through the mediating effects of negative effects on burnout and positive effects on job satisfaction, which was consistent with our
| Age group       | Univariate linear regression | Multiple linear regression (model 1) | Multiple linear regression (model 2) |
|----------------|-----------------------------|-------------------------------------|-------------------------------------|
| <24            | Ref                         | Ref                                 | Ref                                 |
| 24–28          | 0.227 (0.257)               | 0.338 (0.261)                       | 0.539 (0.41)                       |
| >28            | 0.62 (0.402)                |                                     |                                     |
| Gender         |                             |                                     |                                     |
| Male           | Ref                         | Ref                                 | Ref                                 |
| Female         | 0.103 (0.241)               | 0.349 (0.215)                       |                                     |
| Marital status |                             |                                     |                                     |
| Single/divorced| Ref                         | Ref                                 | Ref                                 |
| Married        | 0.333 (0.328)               | 0.078 (0.295)                       |                                     |
| Education      |                             |                                     |                                     |
| Bachelor       | Ref                         | Ref                                 | Ref                                 |
| Master         | 0.316 (0.268)               | 0.395 (0.237)                       |                                     |
| Doctor         | 1.001 (0.54)                | 0.431 (0.518)                       |                                     |
| Annual income level |                   |                                     |                                     |
| <50 000 RMB     | Ref                         | Ref                                 | Ref                                 |
| 50–100 000 RMB  | −0.849 (0.283)**            | 0.133 (0.245)                       | −0.075 (0.267)                      |
| >100 000 RMB    | 1.396 (0.88)                | 1.466 (0.751)                       | 1.005 (0.794)                       |
| Year of training |                             |                                     |                                     |
| 1              | Ref                         | Ref                                 | Ref                                 |
| 2              | 0.111 (0.41)                | −0.278 (0.336)                      | −0.252 (0.338)                      |
| 3              | −0.947 (0.404)*             | −1.154 (0.333)**                    | −1.045 (0.348)**                    |
| Specialty      |                             |                                     |                                     |
| Internal medicine | Ref                     | Ref                                 | Ref                                 |
| Surgery        | −0.551 (0.341)              | −0.744 (0.285)**                    | −0.604 (0.299)*                     |
| Gynaecology & obstetrics, general medicine and paediatrics | −1.150 (0.358)**   | −0.693 (0.297)*                     | −0.649 (0.299)*                     |
| Neurology, psychiatry, emergency and anaesthesiology | 0.001 (0.38)        | −0.338 (0.313)                      | −0.279 (0.315)                      |
| Others         | −0.651 (0.348)              | −0.737 (0.285)*                     | −0.689 (0.285)*                     |
| Nightshift interval |                       |                                     |                                     |
| <7 days        | Ref                         | Ref                                 | Ref                                 |
| ≥7 days        | −0.533 (0.238)*             | −0.218 (0.196)                      | −0.234 (0.197)                      |
| Working hours  |                             |                                     |                                     |
| <45 hours/week | Ref                         | Ref                                 | Ref                                 |
| 45–54 hours/week | 1.134 (0.480)*             | 0.462 (0.215)                       | 0.454 (0.215)                       |
| >54 hours/week | 2.018 (0.585)**             | 0.479 (0.310)                       | 0.452 (0.310)                       |
| Career in medicine |                       |                                     |                                     |
| No             | Ref                         | Ref                                 | Ref                                 |
| Yes            | −2.243 (0.238)***           | −1.295 (0.212)***                   | −1.307 (0.212)***                   |
| Necessity of training |                   |                                     |                                     |
| Unnecessary    | Ref                         | Ref                                 | Ref                                 |
| Neutral        | −1.415 (0.286)***           | −0.796 (0.260)**                    | −0.774 (0.260)**                    |
| Necessary      | −3.136 (0.572)***           | −1.728 (0.518)                      | −1.738 (0.519)                      |

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hypothesis (H4). These demonstrated that individual affective commitment towards the career and the training would possibly affect the quality of relationships between the trainees and the programmes distinctively. This was also proven in US surgeons that those who were unhappy with career choice had reduced job satisfaction, as well as in Italian nurse population that those with high levels of individual affective commitment had low levels of turnover intention.51

In accordance with earlier studies among other physician populations and our hypothesis (H2), burnout was considered as a risk factor because it was positively associated with turnover intention among Chinese SRTP residents in all models. Burnout was quite common in medical residents all over the world, as residency training can be a very stressful time for them to carry responsibilities on providing care while learning and gaining new skills. According to a recent meta-analysis using studies from 47 countries, the prevalence of burnout among residents varied widely by region, with a pooled prevalence of 47.3%. As a matter of fact, a high rate of burnout among standardised trained residents was reported in a single tertiary hospital in central China (71.5%), and in our previous research among residents from four sites of SRTP in Shanghai (71.4%). Our study demonstrated that burnout had a directly positive effect on turnover intention while serving as a mediator. Therefore, interventions designed to alleviate burnout would be effective in reducing the turnover intention. Actions such as reducing workload, cultivating positive attitudes towards training, and enhancing psychological resilience would have opportunities to, directly and indirectly, decrease the turnover intention through reducing burnout.

With regard to our hypothesis (H3), psychological resilience and job satisfaction, which were conventional protective factors in previous studies, showed opposite results in our sample. Psychological resilience was positively associated with turnover intention in linear regressions while job satisfaction was insignificant. SEM demonstrated that they both had positive total effects on turnover intention, though the effects were relatively limited (total effect $\beta=0.066$ and $\beta=0.022$, respectively). The possible reason for this discrepancy was that those who rated their resilience higher might also have more confidence in finding new jobs, leading to a higher turnover intention score. Besides, the psychological resilience had a positive effect on job satisfaction ($\beta=0.629$) and a negative effect on burnout ($\beta=-0.293$), which were consistent with previous research, indicating that SRTP residents with better resilience experienced less burnout and higher job satisfaction. Though resilience and job satisfaction were not proven to be protective factors of turnover intention in our sample, they are still essential in helping physicians to achieve less burnout. Chinese students received little or no training on enhancing psychological resilience during medical school. Therefore, enhancing psychological resilience during residency could lead to better

| Table 4 Continued |
| --- |
| **Turnover intention score** | Univariate linear regression | Multiple linear regression (model 1) | Multiple linear regression (model 2) |
| **Coefficient (SE)** | **Coefficient (SE)** | **Coefficient (SE)** |
| **Satisfaction with income** | | |
| Dissatisfied | Ref | Ref | Ref |
| Neutral | $-0.567 (0.345)$ | $-0.266 (0.292)$ | $-0.225 (0.295)$ |
| Satisfied | $-1.576 (0.321)^{***}$ | $-0.739 (0.284)^{**}$ | $-0.682 (0.286)^*$ |
| **Psychological resilience** | 0.040 (0.007)$^{***}$ | 0.092 (0.009)$^{***}$ | 0.093 (0.009)$^{***}$ |
| **Job satisfaction** | 0.014 (0.008) | 0.019 (0.01) | 0.018 (0.01) |
| **Burnout** | 0.118 (0.007)$^{***}$ | 0.135 (0.007)$^{***}$ | 0.136 (0.007)$^{***}$ |
| **R²** | / | 0.355 | 0.360 |
| **F** | / | 40.386$^{***}$ | 31.169$^{***}$ |

*0.01<p<0.05, **0.001<p<0.01, ***p<0.001.

![Figure 2](image-url) Path coefficients for the final structural equation model in the current study sample. CD, coefficient of determination; CFI, Comparative Fit Index; RMSEA, root mean square error of approximation; SRMR, standardised root mean square residual; SRT, standardised residency training; TLI, Tucker-Lewis Index.
training results and strengthen their work engagement and career commitment.43

**Educational implications**

This study revealed a high prevalence of turnover intention among SRTP residents. Evidence on factors and mediators for turnover intention inspired us to make suggestions on incorporating interventions into the training programmes. First, alleviating work burnout would be imperative and effective to prevent attrition among Chinese residents, as burnout could happen at the very early stage of career and contribute to turnover intention. Hence, programme directors of the SRTP should monitor the extent and the causes of burnout among their residents through active communication and feedback, and design interventions accordingly, such as assigning mentors or senior residents to junior residents, adjusting workload and responsibilities, holding Balint sessions or forming assistant groups to help those who have experienced burnout during their training.55–59 Second, cultivating individual affective commitment would be effective in preventing turnover. Our results suggested that residents’ determination of becoming a doctor and positive attitudes towards the new training programme were crucial in supporting them to go through this tough training stage. Unlike in many western countries where only students with the strongest determination are selected into medical school, some Chinese students are reassigned into clinical medicine majors. Without original career commitment and positive perspectives as internal motivation, residents would be susceptible to quitting the programme for other jobs. Therefore, besides enhancing the medical school admission criteria, medical educators could reinforce their positive attitudes towards the medical training by facilitating the formation of a stronger career plan and offering fruitful and meaningful learning experiences. Last but not the least, increasing the income of residents to a satisfactory level is also desperately needed. Though it was regulated that those who quit the training programmes will pay fines, it was not the fundamental way to prevent turnover considering that Chinese residents are relatively underpaid compared with other entry-level professions.60 There should be a national or municipal financial investment and policy to improve and guarantee the income of these young doctors in their earlier careers so that they do not have to be discouraged by not being able to support their families.

**Study limitations**

Due to the cross-sectional design, this study has several limitations. First, it only captured participants’ perceptions on the factors measured at the time of the survey, and data were self-reported and might be influenced by...
recall bias. Though the SEM incorporated the complex mediating effects and calculated the total effect of each factor on turnover intention, it only implied association but no causal relationship. Second, we used the Chinese version of standardised instruments, which might suffer from biases caused by cultural and linguistic differences. We selected scales that have been validated in the Chinese population and conducted a pilot study to minimise such biases. Third, the generalisation of the study results should be taken with caution, because it was unclear how our sampled residents differ from the national residents’ population. To increase the representation, we sampled residents from 10 training institutions located in populous cities from five geographical areas in China. Further studies are required to enrol more institutions so that the results could be confidently generalised to all residents. Fourth, though the study was conducted and data were collected 4 years ago, it still has implication values as the training policy has not been changed much in recent years. As more trainees have graduated from the training programmes, collecting the up-to-date data on the actual turnover behaviours would also be constructive on the improvements of the training programmes. Lastly, we did not construct organisational factors that could also be influential to residents’ intention to leave, such as hospital size, leadership, environment, patient-mix, etc. These factors should be involved in future research to generate more ideas on preventing resident turnover.

CONCLUSIONS
The turnover intention was prevalent among standardised trained Chinese residents. Burnout was the major contributing factor, while the year of training and positive attitudes towards training were important protective factors of turnover intention. Burnout and job satisfaction also served as mediators of turnover intention. These findings call for targeted interventions to be incorporated in the training programmes from educators and policymakers to create a prosperous educational experience and better career development environment for SRTP residents and to eventually prevent turnover. Future research is needed to incorporate more organisational factors, and test if those interventions can diminish the turnover intention.

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