Introduction

The effects of rapid economic development combined with an ageing population have dramatically increased the demand for high-quality medical services. Hospitals must increasingly bear service pressures, and some medical staff have gradually experienced high "professional burnout" and turnover tendencies (1,2). The specific demands of the medical industry are such that medical staff are faced with increasing tension between doctors and patients, an increased need to maintain teaching and academic roles in addition to their clinical activities, and a general increase in public and media scrutiny concerning their activities. In such an environment, work pressure is extremely high (3).
and studies have revealed that work stress has a significant impact on employee job satisfaction, personal growth, and turnover intention (4). There is an urgent need to examine and address the turnover tendency of tertiary hospital medical staff as an important measure in maintaining and improving the quality of medical services in China.

Current domestic and foreign research shows that sources of work stress usually include organizational tendencies, organizational structure, career development, work factors, job roles, and interpersonal relationships (5). Among these, role stress is a common finding in medical staff. Nurses and doctors must adopt a social role in the treatment of patients, an organizational role as a part of the administrative and organizational structure in which they work, and an academic role as a supervisor and researcher within the scientific community. The stress associated with these multiple roles produces role conflict, role ambiguity, and role overload (6,7). Role conflict exists when staff face multiple expectations; from themselves, patients, colleagues, supervisors, administrators, and others. In clinical practice, the judgment of patients’ and estimates of their own conditions often do not match those of nurses and doctors and patients and practitioners often have inconsistent expectations and requirements (8). Disagreement on the choice of assessment and management options between colleagues is another important source of role conflict. The medical workplace is one in which practitioners of various ages, training backgrounds, and clinical experience exist and consensus on which direction to take is often difficult to establish. Role ambiguity occurs when medical staff must assume multiple roles such as treating patients, undertaking research, teaching junior colleagues, and fulfilling administrative duties. This can result in staff developing a blurred understanding of their roles and priorities (9) leading to frustration and uncertainty. Role overload occurs when large workloads clash with available time and the need to devote time to professional development adds to this pressure. The self-confidence of staff is also challenged by the ongoing requirement for them to develop additional capabilities to deal with the rapid technological advances in the field of health care (10).

We examined the effect of role stress on the turnover intention of medical staff in tertiary hospitals via a meta-analysis of existing literature with a view to establishing a theoretical basis for reducing medical staff turnover intention and improving the quality of health care. We present the following article in accordance with the PRISMA reporting checklist (available at http://dx.doi.org/10.21037/apm-20-2446).

Methods

Literature inclusion and exclusion criteria

The inclusion criteria for studies examined in this meta-analysis included the following: (I) medical staff were the research object; (II) the types of nurses included internal medicine nurses and surgical nurses; (III) the publication was written in English; (IV) primary and secondary literature; (V) literature data was complete; (VI) turnover intention was taken as a research variable. The following literature types were excluded from the analysis: (I) studies of non-medical staff; (II) repeated studies; (III) studies with incomplete research results; (IV) review articles.

Literature search strategy

The English search terms used were “nurse”/“medical care personnel”/“paramedic”/“medical staff”, “role stress”, “turnover intention”/“turnover”/“departure”/“intent to leave” and “quit”. Published studies from January 2000 to October 2020 were searched in the English language databases Science Direct, PubMed, Springerlink, CBM, ISI, and Web of Science.

Literature screening

A preliminary screening of the results was performed and relevant information such as the title and abstract of the citation obtained were carefully read and studies obviously not meeting the inclusion criteria were eliminated. The full text of remaining studies was then read and those which featured inconsistent research objects, incomplete article data, inconsistent inclusion criteria, and inconsistent evaluation indicators were eliminated. In cases of ambiguity, the corresponding author of the study was contacted to seek clarification before the study was included in our analysis.

Outcome indicators

The turnover intention and role stress scales were used. The outcome indicator was the r value obtained according to Pearson correlation coefficient analysis, which represented the correlation between role stress and turnover intention. A positive r value indicated a positive correlation between role stress and turnover intention and negative value
indicated a negative correlation between the two.

**Literature data extraction**

The obtained literature was organized and analyzed, and the author information, publication time, research object, and number of research samples were extracted. A total of 12 English language publications met the meta-analysis standards and these were carefully read and subject to data extraction. The extracted content included the sample size of the research objects, the selection criteria, the related scale to evaluate the turnover intention, the relevant scale to evaluate the role stress, and the correlation coefficient between the two.

The turnover intention was mainly evaluated by the TIQ scale (11). The assessment content involved six items and three dimensions, including the possibility of resigning from the current job, seeking other work motivations, and the possibility of obtaining external work. The sum of the six items was the total score. The higher the scale score, the stronger the turnover intention. The reliability of Cronbach’s $\alpha$ coefficient of the TIQ scale was 0.865, and the content validity was 0.78.

Role stress was mainly evaluated by the role stress scale (12), which involved four parts and three dimensions, including eight role conflicts, six role ambiguities, five role overloads (quantity), and five role overloads (quality). Likert 5-point scoring was adopted for scoring with a higher score indicating the greater the role stress of the individual.

The internal consistency coefficients of role conflict, role ambiguity, and role overload were 0.835, 0.848, and 0.8163, respectively. The reliability of the scale Cronbach’s $\alpha$ coefficient was 0.874.

**Literature quality evaluation**

The STROBE checklist methodology was combined with the systematic evaluation method of the observational research quality evaluation tool in Sanderson and other studies, and the quality of all included literature and methodology were evaluated comprehensively. This included research object inclusion criteria and sources, research location, institution, relevant data, statistical methods, defined outcomes, confounding factors, data sources of meaningful variables, control methods for potential bias, sample determination methods, and descriptions of conflicts of interest.

**Statistical processing**

Review Manager 5.3 software was adopted to conduct the meta-analysis and the correlation coefficient $r$ of role stress and turnover intention, and the value of correlation coefficient $r$ of each dimension were input into the software. The R software instruction was set as follows: library (grid); library (meta); datal<-data.frame [study=numeric(0), n=numeric(0), r=numeric(0)]; datal<-metacor (r,n,data=datal,sm=ZCOR’); forest(datal), summary(datal); funnel(datal); metabias (datal,method=“linreg”). The statistical methods used included heterogeneity detection, meta-analysis, and publication bias analysis. $Q$ test was adopted to test for heterogeneity. When $P<0.05$ and (or) $I^2>50\%$, the included studies were considered to be heterogeneous, and random effects models (REM) analysis was used. When $P>0.05$ and (or) $I^2<50\%$, the included studies were regarded as homogeneous, and fixed effects model (FEM) analysis was performed. Finally, the funnel plot was used to evaluate and analyze the publication bias of the included studies. When $P<0.05$, the difference between groups was considered to be statistically significant.

**Results**

**Literatures search results**

A duration limit from January 2000 to October 2020 was set and resulted in the retrieval of 436 publications. Of these, 92 were retrieved from the PubMed database, 65 from the ISI Web of Science database, 103 from the Springlink database, and 176 from the Science Direct database. After Endnote X8 software was adopted to remove repeated publications and post-processing, 214 publications remained. The title, abstract, and full text of each publication was carefully read and further duplicate publications and literature reviews were excluded. Finally, a total of 12 publications were included in this study. The basic process of literature screening is shown in Figure 1 and the basic information on included research publications shown in Table 1.

**Literature quality evaluation results**

The 12 publications included in the study correspond to (13-24), and the quality evaluation results are shown in Table 2. All publications described the relevant content of the research design, including research object, inclusion criteria and sources, research locations, institutions,
relevant data, and statistical methods. Eight publications (66.7%) defined outcomes and confounding factors, and provided data sources for meaningful variables and four (33.3%) explained potential bias control methods. Three publications (25%) gave sample determination methods, and none explained conflicts of interest. Based on the above results, the included publications were of high quality.

Analysis of overall correlation coefficient between role stress and turnover intention

Figure 2 shows the heterogeneity test result was tau-squared = 0.0043, $I^2 = 69.5\%$, and $P < 0.01$, suggesting that the research was very heterogeneous, so the RFM was used for analysis. RFM was adopted to calculate turnover intention and role stress, the combined effect $r$ and 95% CI were 0.2503 (0.2235–0.3489), and the difference was evident ($P < 0.01$). Figure 3 is a funnel plot of the publication bias analysis of role stress and turnover intention. The distribution of various studies on both sides of the funnel was basically symmetrical, indicating that there was no obvious publication bias. Egger’s test indicated $P > 0.05$, further indicating there was no obvious publication bias.

Analysis of the correlation coefficients of turnover intention and role stress in each dimension

The test results of turnover intention and role conflict heterogeneity are shown in Figure 4, tau-squared = 0.00135, $I^2 = 83\%$, and $P < 0.01$, indicating the research was very heterogeneous, so the REM was used for analysis. The turnover intention and role conflict were calculated, the combined fisher’s Z and 95% CI were 0.2838 (0.1810–0.3928), and the difference was greatly notable ($P < 0.01$). Figure 5 is a funnel plot of turnover intention and role conflicts which is symmetrical, indicating the possibility of new publication bias is small.

The results of the fuzzy heterogeneity test of turnover
### Table 1 Basic information included in the literature

<table>
<thead>
<tr>
<th>First author</th>
<th>Publish year</th>
<th>Sample size</th>
<th>Role conflict</th>
<th>Role ambiguity</th>
<th>Role overload</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Han SS</td>
<td>2015</td>
<td>n</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>Role conflict was positively correlated with turnover intention and role ambiguity was positively correlated with turnover intention (P&lt;0.001)</td>
</tr>
<tr>
<td>Elçi M</td>
<td>2012</td>
<td>500</td>
<td></td>
<td>✓</td>
<td></td>
<td>There was a positive correlation between role stress and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>Lou JH</td>
<td>2007</td>
<td>1,093</td>
<td></td>
<td>✓</td>
<td></td>
<td>There was a positive correlation between role stress and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>Mosadeghrad AM</td>
<td>2013</td>
<td>91</td>
<td></td>
<td>✓</td>
<td></td>
<td>There was a positive correlation between role stress and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>Morter</td>
<td>2010</td>
<td>296</td>
<td></td>
<td>✓</td>
<td></td>
<td>There was a positive correlation between role overload and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>O’Brien-Pallas L</td>
<td>2010</td>
<td>176</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>Role conflict was positively correlated with turnover intention and role ambiguity was positively correlated with turnover intention (P&lt;0.001)</td>
</tr>
<tr>
<td>Jang HJ</td>
<td>2013</td>
<td>4,481</td>
<td></td>
<td>✓</td>
<td></td>
<td>There was a positive correlation between role stress and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>Sung MH</td>
<td>2013</td>
<td>573</td>
<td></td>
<td></td>
<td>✓</td>
<td>There was a positive correlation between role overload and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>Tziner A</td>
<td>2015</td>
<td>504</td>
<td></td>
<td></td>
<td>✓</td>
<td>There was a positive correlation between role stress and turnover intention (P&lt;0.01)</td>
</tr>
<tr>
<td>Al-Hawajreh KM</td>
<td>2011</td>
<td>124</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>Role conflict was positively correlated with turnover intention and role ambiguity was positively correlated with turnover intention (P&lt;0.001)</td>
</tr>
<tr>
<td>Cui Y</td>
<td>2011</td>
<td>144</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>Role conflict was positively correlated with turnover intention and role ambiguity was positively correlated with turnover intention (P&lt;0.001)</td>
</tr>
<tr>
<td>Kim KS</td>
<td>2013</td>
<td>168</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>There was a positive correlation between role overload and turnover intention (P&lt;0.01)</td>
</tr>
</tbody>
</table>
The results of the heterogeneity test of turnover intention and role overload are shown in Figure 8. Tau-squared =0.0001, $I^2=0\%$, and $P>0.05$. This suggest the research had little heterogeneity, so the FEM was used for analysis. The FEM was adopted to calculate turnover intention and role overload, fisher’s Z, and 95% CI were 0.2687 (0.2135;
0.3428), and the difference was remarkable (P<0.01).

Figure 9 is a funnel plot of turnover intention and role overload. The funnel plot is symmetrical, and the possibility of new publication bias is small.

Discussion

The main sources of work pressure in the workplace are working conditions, role pressure, interpersonal relationships, career development, organizational systems, and the interaction of family and work. Among which, role pressure stimulates the individual's negative emotions, which in turn affects the individual's impact on job satisfaction and job performance. Therefore, it is an important source of work stress (25). The work of medical staff is relatively special. Under the environment of tension between doctors and patients, media focus, and increased social supervision, medical staff have long been faced with pressure from work, patients, and the environment. Since the tertiary hospitals are the highest-level hospitals outside of the national special hospitals in China, the stability and work quality of its medical staff significantly affect the overall level of China's medical services. Therefore, Medical staff in tertiary hospitals experience discipline specific role stress and this kind of pressure has a negative effect on employee enthusiasm for work and mental health. Staff may become emotionally exhausted and the tendency for turnover intensifies.

The meta-analysis results of this work show that the role pressure (including various dimensions: role conflict, role ambiguity, and role overload) of medical staff in the tertiary hospitals has a significant positive correlation with the willingness to resign. The greater the role pressure of medical staff in the tertiary hospitals, the stronger the willingness to resign. The results are basically consistent with those of Mosadeghrad et al., which proved that the greater the work pressure, the stronger the willingness of hospital employees to quit (26). Therefore, it is important to establish a sound method to both monitor medical staff role stress and prevent its escalation. Role stress experienced by medical staff usually arises in three ways; through role conflict, role ambiguity, and role overload (27). In the hospital environment a particular clinical circumstance may require multiple treatments and examinations, and there is a problem of overlapping responsibilities. Moreover, medical staff also need to cope with the pressure of academic research and career promotion when performing their daily duties. For these and other reasons, staff develop a sense of ambiguity about their roles leading to uncertainty regarding their real focus, an ability to prioritize, and fatigue. At this time, managers are required to understand the demands of employees, so as to give more support, care, and recognition. Moreover, corresponding career development plans should be formulated, and the career promotion channels should be issued and optimized to help medical staff to position themselves. Role conflict manifests when competing desires and agendas clash within the clinical
environment. This may occur between staff and patients, staff and their colleagues, and staff and others within the organizational structure. Trust, respect and a clear understanding and appreciation of the roles which each individual has is essential in combatting role conflict. Good communication underpins this and there is an ongoing need for medical staff to undertake training in communication skills. It can be implemented through the establishment of communication groups, regular vocational training, and the organization of daily entertainment activities. Methods such as timely assistance when they face difficulties can improve the communication skills of medical staff with patients and their families, colleagues, and family members. The frustration felt by staff because of their heavy workload and high work pressure can be intensified by a loss of lack of self-confidence created by the need to keep abreast of technological developments in the medical workplace. The demand to keep up with the ongoing introduction of new techniques and procedures can create a sense of helplessness and inadequacy which may convert to turnover intention. At this time, managers are required to create a supportive management atmosphere. After the hardware facilities in the work environment are updated, it is imperative to pay attention to and regularly provide medical staff in various departments with advanced technical training, to improve their professional capabilities, and improve the negative emotions caused by the rapid development of medical technology.

Though no review restrictions were encountered during the research, yet only one indicator of Person correlation coefficient was analyzed. There is a certain degree of bias in the selection of the indicator. Therefore, it is necessary to expand the sample size in the follow-up studies and conduct a comprehensive analysis with Spearman correlation coefficient and other indicators. Nevertheless, this study can still provide a theoretical basis for further research and analysis of the effect of role stress on the turnover intention of medical staff in tertiary hospitals.

### Conclusions

This meta-analysis resulted in 12 publications that focused on the effect of role stress on the turnover intention of medical staff in tertiary hospitals. The results showed that role stress was positively correlated with turnover intention and this correlation was maintained across each dimension of role stress; role conflict, role ambiguity, and role overload. The greater the role stress that the tertiary hospitals medical staff bear, the stronger the turnover intention. We recommend the implementation of measures to address role stress within the hospital environment so staff loss can be avoided and high-quality services can be maintained. Only the Person correlation coefficient index was selected for analysis and other indicators such as Spearman's correlation coefficient or regression coefficient were not used. This may have created a bias within the

### Figure 6
Comparison of intention turnover and role ambiguity via fishers' Z.

### Figure 7
Funnel plot of intentional turnover and role ambiguity.

<table>
<thead>
<tr>
<th>Study</th>
<th>Total</th>
<th>COR</th>
<th>95%CI</th>
<th>W(fixed)</th>
<th>W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Han SS 2015</td>
<td>243</td>
<td>0.20</td>
<td>[0.10, 0.34]</td>
<td>8.9%</td>
<td>10.3%</td>
</tr>
<tr>
<td>O’Brien-Pallas L 2010</td>
<td>103</td>
<td>0.24</td>
<td>[0.04, 0.37]</td>
<td>8.7%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Al-Kawajreh KM 2011</td>
<td>623</td>
<td>0.32</td>
<td>[0.28, 0.36]</td>
<td>30.1%</td>
<td>18.5%</td>
</tr>
<tr>
<td>Cui Y 2011</td>
<td>564</td>
<td>0.30</td>
<td>[0.25, 0.39]</td>
<td>22.1%</td>
<td>18.3%</td>
</tr>
<tr>
<td>Kim KS 2013</td>
<td>185</td>
<td>0.41</td>
<td>[0.09, 0.24]</td>
<td>10.3%</td>
<td>15.6%</td>
</tr>
</tbody>
</table>

Fixed effect model 1918 0.25 [0.20;0.33] 100% -
Random effects model 0.26 [0.24;0.35] - 100%

Heterogeneity: I-squared=74.2%, tau-squared=0.0068, p=0.0012

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results so the findings must be approached with caution.

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**Footnote**

**Reporting Checklist:** The authors have completed the PRISMA reporting checklist. Available at [http://dx.doi.org/10.21037/apm-20-2446](http://dx.doi.org/10.21037/apm-20-2446)

**Conflicts of Interest:** All authors have completed the ICMJE uniform disclosure form (available at [http://dx.doi.org/10.21037/apm-20-2446](http://dx.doi.org/10.21037/apm-20-2446)). The authors have no conflicts of interest to declare.

**Ethical Statement:** The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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