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Nursing professionals' mental well-being and workplace impairment during the COVID-19 crisis: A Network analysis

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Abstract

Aim: To investigate the effects of years of nursing experience and mental health on work impairment among nurses during the COVID-19 crisis.

Background: During the COVID-19 crisis, nurses experience a greater psychological burden than other health care workers. Studies have not yet investigated the effects of years in nursing and mental health on potential work impairment during the COVID-19 crisis in nurses.

Methods: A survey was administered to 83 nurses on active duty during the COVID-19 crisis. The graphical LASSO and the DAG helped estimate the associations between years of nursing experience, mental health and work impairment.

Results: A moderate negative correlation emerged between years of nursing experience, avoidance and work impairment. A direct effect was observed between anxiety and work impairment. A moderate positive correlation emerged between anxiety, depression and work impairment. An indirect effect was observed between depression, burnout, insomnia, years of nursing experience and work impairment.

Conclusions: In the present sample, nurses' work impairment decreased with greater years of nursing experience and increased with higher anxiety, depression, burnout and avoidance levels.

Implications for Nursing Management: These findings can help design effective infectious disease management programmes for students and professionals in nursing to prevent breakdowns and avoid work impairment.

KEYWORDS
anxiety, COVID-19, depression, nurses, work impairment

1 | BACKGROUND

Nurses play a critical role in health care. However, currently, the United States does not have enough nurses. To that end, it is known that there will be more registered nurse jobs available through 2022 than any other profession in the United States (Slattery et al., 2016).

Anxiety and depression are common mental health issues in many first responders including nurses and allied health professionals (Magnavita, 2009; Magnavita et al., 2011, 2020; Magnavita & Fileni, 2014; Magnavita & Heponiemi, 2011). Work impairment,

which refers to impairments at work (e.g. low productivity, medication errors, needle stick injuries and decreased patient satisfaction) (Gartner et al., 2010; McKnight & Kashdan, 2009), is known to be affected by nurses' mental well-being. Specifically, lack of mental well-being may lead to work impairment (Magnavita, 2006, 2007; Magnavita et al., 2010) that jeopardizes patients' safety and the quality of the care they receive (Gartner et al., 2010; Suzuki et al., 2004).

Recently, it has also been argued that nurses, depending on their years in nursing, face specific mental health challenges that may affect work impairment. During the coronavirus disease 2019 (COVID-19)

crisis, nurses have been facing unique challenges due to responding to the high number of cases within life-threatening work environments (Labrague & de Los Santos, 2020). Consequently, there is a call for research into nurses' work impairment depending on mental health issues and their overall experience in nursing (Magnavita et al., 2020).

For a brief background, the COVID-19 pandemic started in China in late 2019 and spread prolifically across the globe. At the present moment, there are over 40 million COVID-19 cases and over 1 million deaths from 215 countries and territories since the first reported case in China. Currently, the United States has the highest number of confirmed cases and fatalities (World Health Organization [WHO], 2020). The latter means that health care workers across the country have been responding to a great number of COVID-19 cases and will likely respond to even higher numbers until a vaccine is widely available.

With regard to nurses' mental well-being, recent reports from China have also suggested that nurses who were directly involved in the treatment of COVID-19 experience more psychological burden compared with other health care workers (Kang et al., 2020; Lai et al., 2020). Others have also shown that in Singapore and India, at least 20% of these nurses and doctors experienced physical symptoms of stress and anxiety such as insomnia and headaches (Chew et al., 2020) due to challenges associated with working during the pandemic. Additional sources of stress for these workers include the fear of bringing COVID-19 home to family members and worries related to caring for family members should they become ill (Labrague & de Los Santos, 2020; Shanafelt et al., 2020). Therefore, for health care workers, the threat of contracting COVID-19 along with an unusually high workload, as well as additional fears and worries, increases the odds of presenting mental health issues (Spoorthy et al., 2020).

Finally, also related to mental health in this population, compassion fatigue is common among nurses (Nolte et al., 2017). Compassion fatigue results from the fatigue for caring for a patient. It negatively affects the mental health of nurses, decreases their job satisfaction and potentially lowers their productivity at work (Lombardo & Eyre, 2011). Interestingly, however, a recent study from Spain has shown that while the level of compassion fatigue remained moderate/high for health care professionals during the COVID-19 crisis, compassion satisfaction (i.e. the opposite of compassion fatigue) increased among nursing professionals; hence, there is a need for further investigation into nurses' mental health and work impairment during the pandemic (Ruiz-Fernández et al., 2020).

In response to calls for additional research into mental health and work impairment in nurses in general (Magnavita et al., 2020) and during the COVID-19 crisis specifically (Labrague & de Los Santos, 2020), the purpose of this study was to assess the relationship between years of nursing experience, mental health issues and work impairment among nurses during the COVID-19 crisis in the United States. To identify potential causal relationships, the graphical LASSO (Least Absolute Shrinkage and Selection Operator) (Friedman et al., 2008) algorithm was used. A Bayesian network analysis was also applied, and a directed acyclic graph (DAG) (Pearl

et al., 2016) was used to determine the direction of the causal relationships between years of nursing experience, mental health variables and work impairment.

2 | METHODS

This study was approved by the principal investigator's Institutional Review Board prior to data collection. Potential participants were identified via the student and alumni listserv of a College of Nursing at an urban midwestern university. Potential participants received email invitations along with a description of the study. An online survey link was included within the recruitment email. A snowball recruitment strategy allowed participants to share their recruitment emails with others in their network of nursing professionals. Inclusion criteria consisted of nurses working at any health or health-related organisations. Nurses who were not currently working or working at administrator-level positions were not included in this study.

2.1 | Instrument

The online survey consisted of 117 items that were drawn from previously validated instruments. The survey items assessed mental health including depression, anxiety, insomnia, distress and work impairment. Survey items were extracted from the following standardized instruments.

2.1.1 | Patient Health Questionnaire

Patient Health Questionnaire (PHQ-9) measures possible signs of depression. PHQ-9 includes nine Likert-scale items scored from '0' (not at all) to '3' (nearly every day). PHQ-9 is a reliable instrument to measure depression. Based on Kroenke, Spitzer, and Williams's study (2001) with 6,000 individuals surveyed, PHQ-9 had Cronbach's α of 0.89. PHQ-9 had Cronbach's α of 0.89 in this study.

2.1.2 | Generalized Anxiety Disorder Scale

Generalized Anxiety Disorder (GAD-7) Scale assesses anxiety levels. The scale includes seven Likert-scale items scored from '0' (not at all sure) to '3' (nearly every day). GAD-7 is a reliable measure of anxiety. Based on Zhong et al.'s study (2015) with 2,978 individuals surveyed, GAD-7 had Cronbach's α of 0.89. GAD-7 had Cronbach's α of 0.93 in this study.

2.1.3 | Insomnia Severity Index

The Insomnia Severity Index (ISI) measures the level of insomnia. The scale includes seven Likert-scale items scored from '0' (none) to '4'

(very severe). ISI is a reliable instrument. Based on Morin et al.'s study (2011) with 959 individuals surveyed, ISI had Cronbach's α of 0.91. In this study, ISI had the same Cronbach's α value as Morin et al.'s.

2.1.4 | Impact of Event Scale-Revised

Impact of Event Scale-Revised (IES-R) measures the level of avoidance and hyperarousal. IES-R includes 22 Likert-scale items scored from a '0' (not at all) to '4' (extremely). Based on Creamer et al.'s (2003), and Weiss & Marmar's studies (1997) with over 250 individuals surveyed, IES-R had Cronbach's α of 0.84 for avoidance and from 0.79 to 0.91 for hyperarousal. IES-R had Cronbach's α of 0.86 for avoidance and 0.85 for hyperarousal in this study.

2.1.5 | Compassion Fatigue

Compassion Fatigue and Satisfaction Self-Test (CFS) measures compassion fatigue. CSF includes 66 Likert-scale items scored from '0' (never) to '5' (very often). Based on Fig ley and Stamm's (1996) study with 370 individuals surveyed, CSF had Cronbach's α of 0.87. In this study, CSF had Cronbach's α of 0.84.

2.1.6 | Work Productivity and Activity Impairment Questionnaire

Work Productivity and Activity Impairment Questionnaire (WPAI: GH) measures the impact of health problems on one's ability to work. WPAI:GH includes one Yes/No, three open-ended and two Likert-scale items. The Likert-scale items are scored from '0' (health problems had no effect on my work) to '10' (health problems completely prevented me from working). Based on Ciconelli et al.'s (2006) study with 100 individuals surveyed, the WPAI:GH had Cronbach's α of 0.74. In this study, WPAI:GH had the same Cronbach's α value as Ciconelli et al.'s.

2.2 | Participants

This project surveyed 124 nurses from the Midwest region of the United States. At the time of data collection, during the COVID-19 crisis, all nurses were active in hospital/clinical settings, schools, homes and correctional institutions. After removing the missing values from the data set, 78 (94%) females, four males (5%) and one non-binary individual (1%) completed the survey in its entirety ($N = 83$). Of these participants, 48 (58%) had a bachelor's degree, 20 (24%) had a master's degree, and two (2%) had advanced practice degrees with two (2%) holding a doctoral degree (Ph.D.) as their highest degree. Additionally, 54 (65%) participants were working at hospitals and 11 (13%) at clinics. Schools, home care and correctional

institutions were the other work settings for the remaining of the participants (22%).

3 | DATA ANALYSIS

3.1 | Partial correlation network

To determine the magnitude of associations among years of nursing experience, mental health variables and work impairment, a partial correlation network was computed by means of graphical LASSO. The graphical LASSO is a technique that identifies the structure and the magnitude of the relationship among the variables in small samples (Finch & Finch , 2016). LASSO technique is an extension of regression analysis that has been used for small samples, hence its particular fit for this study's data set. R packages glasso (Friedman et al., 2014) and qgraph (Epskamp et al., 2012) were used to run the graphical LASSO algorithm. Undirected edges in the network referred to the magnitude of the relationships. Drawing upon the undirected edges within the network, strengths and weaknesses of the relationship between the years of nursing experience, mental health variables and work impairment were identified. However, with LASSO, the direction of the relationships between variables could not be identified. Therefore, a Bayesian network analysis was also applied to compute a directed acyclic graph (DAG) (Pearl et al., 2016) and determine the direction of the relationships among the variables.

The bootnet (Epskamp et al., 2018) R package was used to evaluate the centrality indices (i.e. betweenness, closeness, strength) of the variables. As indicated by McNally et al. (2017), strength in a network of variables represents the strength of the connections in between the variables. Closeness represents the location of each variable compared with other variables in the network. A variable with a higher closeness is considered possessing a higher connection in the network. Finally, betweenness depends on the location of the variables and indicates whether a variable lies between any other variables otherwise connected.

3.2 | Directed acyclic graph (DAG)

Bayesian networks are probabilistic graphical models. In a DAG, Bayesian networks allow users to calculate the conditional probability among variables in the network. The graphical representation of DAG represents the cause-and-effect relationships between the variables.

In this study, in order to obtain the directed DAG among years of nursing experience, mental health variables and work impairment, the R package bnlearn (Scutari, 2010) was used. The package included several different algorithms for building the directed network. In this study, a hill-climbing algorithm was used since the collected data consisted of discrete variables.

4 | RESULTS

4.1 | Partial correlation network

The LASSO graph in Figure 1 illustrates the partial correlation among years of experiences, mental health variables and work impairment. In the figure, positive correlations are shown with blue-coloured edges, while red-coloured edges are used for indicating negative correlations. Faded blue and red represent weaker partial correlations. Analyses indicated a strong positive correlation between anxiety and depression; fatigue and burnout; and hyperarousal and avoidance. There was a strong negative correlation between insomnia and satisfaction. In addition, a moderate positive correlation was revealed between work impairment, anxiety and depression, as well as a moderate negative correlation between work impairment and avoidance. There were also several smaller positive and negative correlations including a negative correlation between the years of nursing experience with work impairment, fatigue, anxiety and avoidance. Additionally, years of nursing experience had a positive correlation with hyperarousal.

Next, Figure 2 depicts the z-scored centrality indices, betweenness, closeness and strength. Since depression, hyperarousal, burnout and avoidance had a z-score higher than zero for each centrality indices, they showed higher centrality among other mental health variables. Compassion fatigue with a z-score close to zero showed the lowest centrality among others. Therefore, while depression had the strongest connections with other variables in the network (z-score > 1), hyperarousal had the highest betweenness and closeness (z-score > 2). Finally, even though anxiety did not have high betweenness (z-score = −1) and closeness (z-score = 0), it had a considerable strength in connection (z-score > 0). Based on these results,
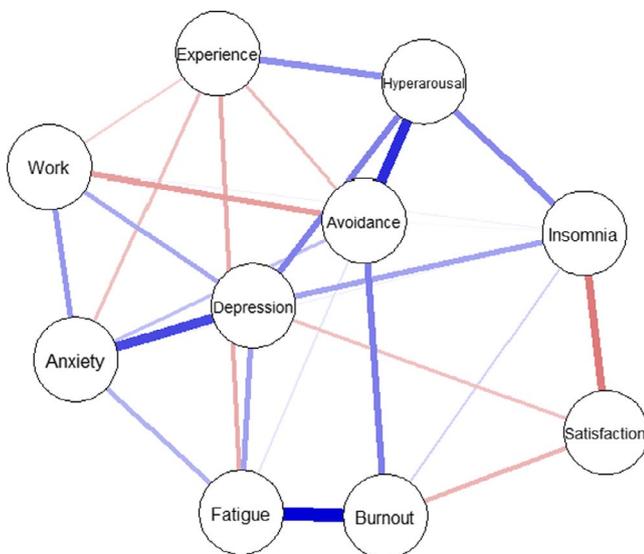

FIGURE 1 The LASSO graph illustrates the regularized partial correlation among years of experiences, mental health variables and work impairment. Positive correlations are shown with blue-coloured edges, while red-coloured edges are used for indicating negative correlations

depression, hyperarousal, burnout, avoidance and anxiety appeared to be important mental health issues that are present in the nurses' during the COVID-19 crisis.

4.2 | Directed acyclic graph (DAG)

Figure 3 illustrates the DAG for the years of nursing experience, mental health variables and work impairment network. As seen in the figure, analyses indicated that nurses' anxiety levels had a direct effect on their work impairment during the COVID-19 crisis. In addition, nurses' level of depression, years of nursing experience, burnout and insomnia during the COVID-19 crisis had indirect effects on nurses' work impairment. Analyses also indicated a conditional probability of experiencing higher work impairment. There were an above 60% probability of decreased productivity, and between 30% and 60% decreased productivity for nurses with moderate or high anxiety levels. The latter means that based on the nurses' survey responses if a nurse experienced high anxiety during the COVID-19 crisis, they also seemed to have an 81% chance to be 31%–60% less productive, while a nurse with moderate anxiety levels during the COVID-19 crisis had 14% chance to experience 31%–60% decreased productivity.

All in all, present analyses accounted for the direct effects of years of nursing experience on burnout, the direct effects of years of nursing experience on depression levels and finally the direct effect of depression on anxiety levels. Specifically, the results showed that a nurse with 10–20 years of experience with a very high risk of burnout, moderate depression and moderate anxiety during the pandemic had a 57% chance to experience above 61% work impairment. On the other hand, a nurse with more than 20 years of experience with a high risk of burnout, severe depression and moderate anxiety during the pandemic had a 20% chance to experience more than 61% work impairment, while they had a 50% chance to experience between 30% and 60% work impairment.

Finally, after adding the insomnia effect to other indirect effects of burnout, years of nursing experience and depression level with the direct effect of anxiety level, the analyses revealed that a nurse with 10–20 years of experience with severe clinical insomnia, extremely high risk of burnout, severe depression and moderate anxiety during the COVID-19 crisis had 33% chance to experience above 61% work impairment. On the other hand, a nurse with less than 10 years of experience with moderate clinical insomnia, high risk of burnout, severe depression and moderate anxiety during the pandemic had a 15% chance to experience above 61% work impairment, while they had a 15% chance to experience between 30% and 60% work impairment.

5 | DISCUSSION

The aim of this study was to assess mental health and its effects on potential work impairment among nurses with different years of experience during the COVID-19 crisis in the US Midwest region. The

FIGURE 2 The z-scored centrality indices, betweenness, closeness and strength in the network. A z-score higher than zero shows a higher centrality in the network
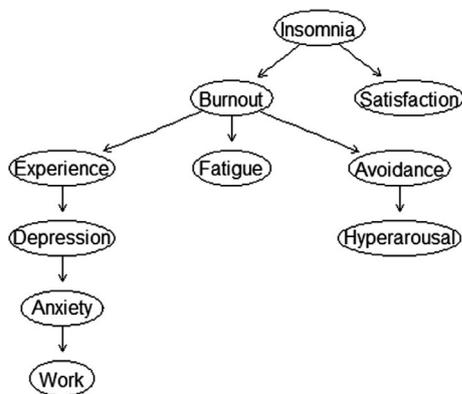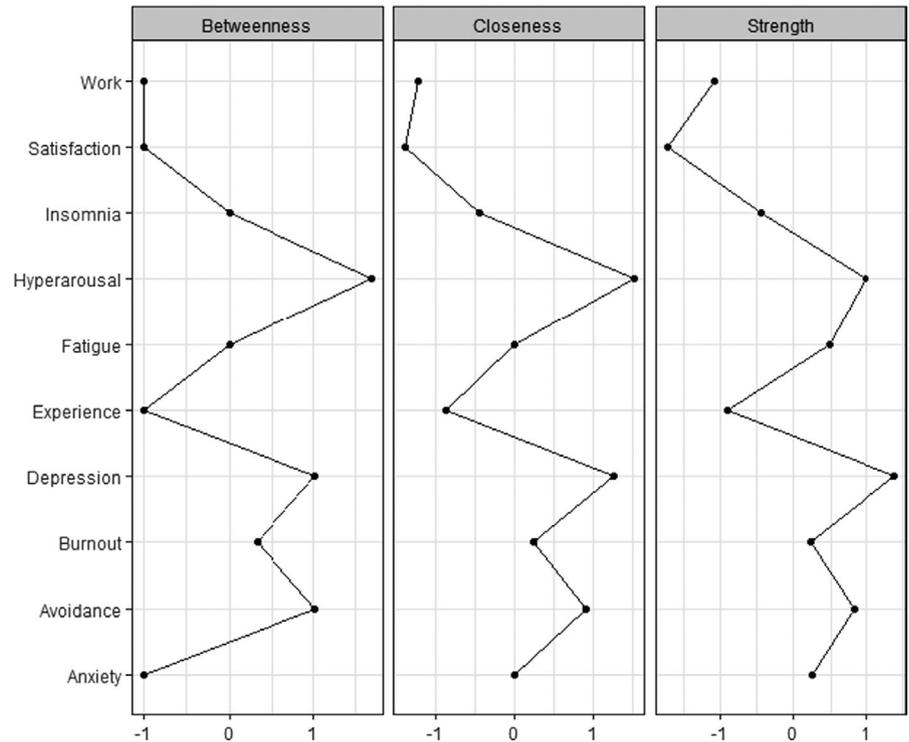

FIGURE 3 The DAG illustrates the years of nursing experience, mental health variables and work impairment network. The DAG represents the cause-and-effect relationships between the variables

present analyses showed that anxiety, depression, avoidance and years of nursing experience impact work impairment. Based on our results, while years of nursing experience and avoidance had a negative correlation with work impairment, anxiety and depression had a positive correlation with work impairment. Therefore, the less experienced nurses with higher depression and anxiety levels during the COVID-19 crisis revealed higher work impairment than their more experienced counterparts. Moreover, nurses with higher avoidance levels showed less work impairment, while they experienced higher burnout and hyperarousal levels. These results are consistent with others that revealed the common occurrence of mental health challenges in health workers including nurses and the negative effects of these on work impairment (Magnavita & Fileni, 2014; Magnavita et al., 2010, 2020).

Present findings also revealed that compassion fatigue had a positive correlation with depression, anxiety and burnout, while anxiety and depression had a positive correlation with work impairment during the COVID-19 crisis. This finding is consistent with prior findings. Lombardo & Eyre's study results (2011) have shown that compassion fatigue in nursing does not only affect the mental health of nurses negatively, but it also decreases their job satisfaction and can negatively affect their work environment by reducing productivity and increasing turnover.

Our findings also indicated the presence of depression, hyperarousal, burnout, avoidance and anxiety in nurses during the COVID-19 crisis. Nurses' anxiety levels had a direct effect on their work impairment. In addition, nurses' years of nursing experience, depression level, burnout and insomnia during the crisis had indirect effects on their work impairment. These findings are consistent with the previous ones (Lai et al., 2020; Ruiz-Fernández et al., 2020) and add to the literature by relating to novel important variables such as compassion fatigue, work impairment and years of nursing experience.

6 | CONCLUSION

Drawing upon these results, during the COVID-19 crisis, nurses seemed to present high risks for depression, anxiety, hyperarousal and burnout, with some indirect effects of these on work impairment. This said, greater years spent in nursing seemed to slightly reduce the risk of experiencing mental health issues, and this is important to note. In conclusion, our results suggested that nurses' years spent in their profession, their mental well-being and their productivity at work are connected. These results are consistent with the previous ones that also revealed that the longer the nurses

remain in practice, the less they may be vulnerable to mental health challenges, which eventually benefit their productivity at work. Future research is needed to shed further light on these dynamics. An in-depth understanding of these dynamics would ultimately help the effective management of unparalleled health care crises such as the current one (Feinstein et al., 2020) or other similar ones.

7 | LIMITATIONS

The present study included several limitations. First, the present sample size was rather small due to local recruitment and the unavailability of nurses during the crisis. Additionally, these findings may not be generalized to the greater population of nurses beyond the Midwest region of the United States. Since overall work impairment was considered in this study regardless of the nurses' field, this study's results may also not apply to nurses with unique specializations. Lastly, the results of this study do not relate to comparative data of pre- and post-COVID-19 assessments. Consequently, the present findings cannot speak to the effects of COVID-19 on the investigated variables but can rather speak to the dynamics of these variables in nurses during the pandemic.

8 | IMPLICATIONS FOR NURSING MANAGEMENT

The presently shown magnitude of mental health issues and their effects on work impairment among nurses during the COVID-19 crisis highlights the importance of disaster preparedness in forms of education or support programmes at nursing colleges and/or practice settings. Also, mental health variables' effects on work impairment should be accounted for within the curricula of nursing colleges and/ or support programmes of hospital administrations.

Specifically, taking these into consideration, nurse managers could be cognizant of the unique challenges that the nurses may be facing during a time of crisis. Recognizing high rates of depression, anxiety and associated work impairment during these times could enable managers for advance preparedness including additional staffing if possible. Managers could also instigate routine mental health checks and services, and support groups for nurses to prevent mental issues and breakdowns during these times. Stress management interventions are known to help reduce stress and anxiety in nurses and nursing students (Jasti et al., 2020; Yazdani et al., 2010). Some of these interventions can include conventional modalities such as talk therapy, while others can include self-care activities such as yoga, relaxation, mindfulness and breathing exercises that nursing professionals may benefit from incorporating into their daily routines.

Nursing colleges can also use this information to design a course for students to manage anxiety, depression and burnout during crises and provide effective care to patients who are also affected by these crises. Additionally, hospital administration and nurse managers can make use of this information to develop support programmes or improve existing ones that focus on stress management for nurses. All in all, this information points to the importance of creating supportive learning and work environments for nursing students and professionals. This is important in order to increase nurses' psychological readiness to continue to address the increasing needs associated with COVID-19 care or any other infectious disease outbreaks in the future.

CONFLICT OF INTEREST
None of the authors have conflicts of interest to report.

ETHICAL APPROVAL
The University of Missouri—St. Louis Institutional Review Board approved this study, with ethical approval IRB #2026883 SL (IRB Application #269909).

DATA AVAILABILITY STATEMENT
Data available on request from the authors: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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