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INVESTIGATION OF THE PANDEMIC PREPAREDNESS EDUCATION OF CRITICAL CARE NURSES

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Abstract

Critical care nurses play important roles in the secondary level management and prevention of communicable disease during a pandemic. These roles include leading the pandemic response, efficiently managing limited resources, instituting infection control, and providing safe and effective care. Nurses face many challenges in adequately performing their roles given the complexity of a pandemic. Therefore, nurses must possess the relevant skills and knowledge to competently execute their tasks. This study aims to identify the research evidence underpinning the knowledge and skills required for critical care nurses to respond to a pandemic as described. An Integrative review (IR) was used and employing studies that used different research designs. As a result, a total of 33 studies were identified; qualitative (n = 17), quantitative (n = 11), and mixed-method studies (n= 5) were retrieved for the review. Emerging themes include staff attitudes and ethics, organisation, planning, and education.

In conclusion critical care nurses need specialised pandemic response education to meet the challenges of managing and preventing disease outbreaks. Hospital planners and educators will benefit from improving institutional pandemic plans to build staff capacity through education and training. However, there is still a need for developing evidence-based curriculum for nursing pandemic preparedness.

Keywords

Pandemic, Communicable, Infectious Disease, Outbreak, Preparedness, Response, Nursing, Critical Care

1. Introduction

With rapid population growth, the number of and risk for pandemics is increasing in many parts of the world (Yang, Lipsitch, & Shaman, 2015). As such, there is a need for health workers that can respond effectively to situations of stable health care demand as well as drastic increases in demand such as during a pandemic. By definition, a pandemic is an infectious disease or an epidemic that has spread over a large geographical area and affects a large number of humans who have little or no immunity to the disease (Payne & Rushton, 2007).

The increased patient volume in a pandemic creates pressure on human and material resources that are often more limited when compared to the need lead (Michaels et al., 2013). An effective response plan to any pandemic, regardless of the cause and severity, puts into place policies, protocols, and guidelines delineating roles and associated responsibilities during each step of the response (McGonagall, 2007). In addition, an effective response plan would establish lines of communication, create collaborative relationships, and promote the efficient use of resources.

1.1 Critical Care Nurses and Pandemic Preparedness Education

Critical care nursing is a field that focuses on caring for acute and chronically ill patients who are at a high risk of mortality if no immediate treatments are given (Adhikari, 2010; Farrar, 2010; Johnson, 2009). Critical care nursing is part of the secondary level of response to a pandemic (Department of Health UK, 2012). Due to the urgency of patients' conditions during a pandemic, achieving equilibrium between the demand and supply of health care services is an important goal (Payne & Rushton, 2007).

Education has been identified as a major requirement of critical care providers in their day-to-day functions as professionals. In addition, education is an essential aspect for the

establishment of a critical care unit needed during times of pressure and resource strain; enhancing the quality, efficiency, and timeliness of service delivery (Aschenbrenner, 2009; D'Antonio & Whelan, 2004; Daugherty et al., 2009; Farrar, 2010; Michael, Helm & Graafeiland, 2009; Molyneux, 2009; Nap et al., 2008; New York City DHMH, 2007; Palazzo, 2001; Sprung et al., 2010; Tegtmeyer et al., 2011; Webb et al., 2009).

Through preparedness, trained critical care nurses are more likely to deliver an effective performance while maintaining the crucial role of the critical care facility, hence, reducing the economic, social, and health-related impact of a pandemic (Payne & Rushton, 2007). For this reason, critical care nurses need pandemic response education and training to adequately prepare them in developing and implementing an adequate response plans (Palazzo, 2011).

2. Methods

2.1 Review Question

To identify the research evidence of knowledge and skills required for critical care nurses response to a pandemic.

2.2 Methodology

The integrative review (IR) consists of five steps: identifying the research problem, data collection, evaluation, analysis, and interpretation (Whittemore & Knafl, 2005) of articles that represent what is known about a topic for the purpose of generating new frameworks and perspectives (Torraco, 2005).

For the purposes of this study, quantitative, qualitative, and mixed-method studies are equally relevant, the IR is concerned more with the results of studies rather than the research design used (Soares et al., 2014). The advantage of an integrative review therefore is that, contrary to a systematic review, it does not discriminate studies on the basis of quality as determined by evidence-based hierarchies.

2.3 Search Terms

The following keywords and its combinations were using during the search (Table 1).

Table 1: *Search Terms*

Keywords	**Combinations (examples)**
Pandemic	Pandemic preparedness;
Communicable	Communicable disease
Infectious	Infectious disease
Disease	Disease preparedness

Outbreak	Outbreak response (AND) critical care
Preparedness	Outbreak preparedness
Response	Pandemic response
Critical Care	Critical care (AND) training
Nursing	Nursing Education
Education	Education (AND) critical care nursing
Training	Training (AND) Pandemic

2.4 Database and Limits

The search was conducted in 5 databases, namely Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medline (PubMed), Google Scholar, and the Nursing Reference Centre of the EBSCO Nursing Resources. The literature was limited to peer-reviewed, primary or secondary articles written in English published within the last 20 years. The timeframe was selected considering that many lessons were learned in the course of local, national, regional, and international responses that drew on the experiences of pandemics and outbreaks in the past century. As such, the responses to more recent pandemics represent how preparedness and approaches to management have evolved and point to areas of further improvement to enhance the responses to future pandemics (Zimmer & Burke, 2009). The inclusion and exclusion criteria are enlisted in Table 2.

2.5 Selection Process

The process of selecting the articles was documented by the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) Flow Diagram (Figure 1).

3. Results

From an initial number of 79 records located, screening and the application of inclusion and exclusion criteria led to the selection of 33 eligible studies. Of the studies included in the sample, 17 were qualitative studies, 11 were quantitative studies, and 5 were mixed-method studies. The articles are summarised in Table 3.

3.1 Emerging Themes

A number of factors are important for critical care nursing practice during pandemics. Such factors are expressed as themes in the literature. Themes, for the purposes of this integrative review, are common categories of information revealed during the course of the literature review (Whittemore & Knafl, 2005). The four themes are education, organisation,

planning, and staff attitudes and work ethics. During the review the articles were categorized according to these themes.

Table 2: *Inclusion and Exclusion Criteria*

Inclusion Criteria	Exclusion Criteria
✓ Research conducted in settings that include critical care such as the ICU, coronary care unit, and emergency department ✓ Critical care nurses included in the study sample ✓ Evaluation studies focusing on the education and training of critical care nurses and/or related policies and guidelines ✓ Studies describing the development and/or implementation of pandemic response education and training of critical care nurses ✓ Studies documenting the efficacy or impact of pandemic response education and training of critical care nurses ✓ Qualitative studies documenting experiences with and/or feedback on pandemic response education and training ✓ Expert opinion on what should comprise pandemic response education and training	✓ Research conducted in non-critical care settings ✓ Study samples that do not include critical care nurses ✓ Descriptive, evaluation, and efficacy studies that do not include the education and training component or related policies and guidelines of the pandemic response or preparation ✓ Qualitative studies that do not include themes related to the pandemic preparedness education or training of critical care nurses ✓ Expert opinion on pandemic preparedness or response that do not include recommendations for education or training

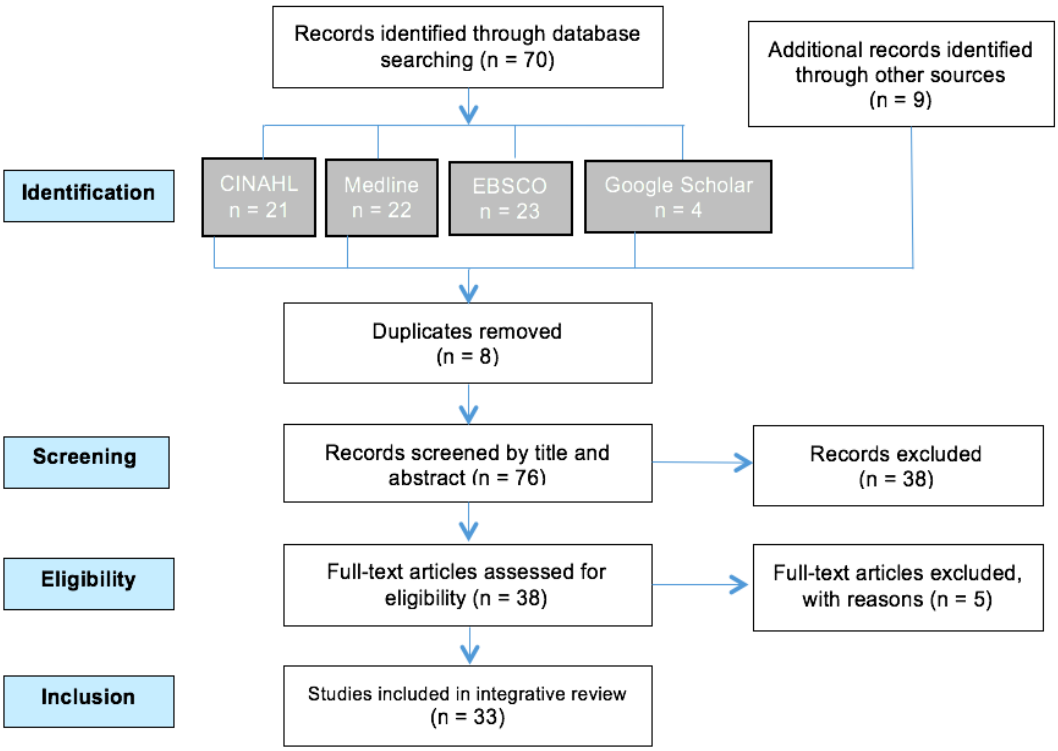

Figure 1: *PRISMA Flow Diagram*

3.1.1 Education

A high number of articles (n = 24) presented information on the education of critical care professionals (Aschenbrenner, 2009; D'Antonio & Whelan, 2004; Daugherty et al., 2009; Farrar, 2010; Michael, Helm & Graafeiland, 2009; Molyneux, 2009; Nap et al., 2008; New York City DHMH, 2007; Palazzo, 2001; Sprung et al., 2010; Tegtmeyer et al., 2011; Webb et al., 2009). Educational requirements were frequently cited as part of pandemic response plans (Amaratunga et al., 2007; Davey, 2007; Department of Health UK, 2012; Hovarth et al., 2006; Jackobson, 2010; McGonagle, 2007; Ma et al., 2011; Martin et al., 2013; Molyneux, 2010; Parry et al., 2011; Payne & Rushton, 2007; Stephens, 2013; Veenema & Toke, 2007). On the other hand, Ma et al. (2011), in their study on the knowledge and attitudes of healthcare workers in Chinese ICUs during the 2009 H1N1 influenza pandemic, offered quantitative evidence concerning educational deficiencies. The researchers found that respondents expressed insufficient knowledge of the HINI influenza and strategies of personal protection and infection control after they reported attending a related training programme.

Table 3: *Summary of the Articles Included in the Review*

	Author/Year	Study Design	Themes	Purpose	Key findings related to themes
1	Amaratunga et. al 2007	Mixed	Education Staff Attitudes	Evaluate the pandemic influenza preparedness plans of hospitals	The study revealed gaps in personnel education, personal protective equipment supply and use, and information dissemination implying that health care workers are at risk of contracting communicable disease during a pandemic.
2	Aschenbrenner, D.S. 2009	Qualitative	Organisation Planning	Explore hospital nurses' experiences during pandemics	Nurses highlighted the importance of the activities during a pandemic such as vaccination against the disease and performance of injections correctly to ensure effectiveness.
3	Bulman, A. 2009	Qualitative	Education	Roles of the American Red Cross in situations requiring emergency responses	The American Red Cross played and continues to play an indispensable role in the areas of nurse training during pandemics and disasters.
4	Bulman, A. 2010	Qualitative	Education Organisation	Explore the historical contributions of Black American nurses in the management of disasters and epidemics	Black American nurses historically contributed to the response to pandemics by establishing nurse training programmes and, through leadership, asserting their participation.
5	Contrada, E. 2013	Quantitative	Education Organisation Staff Attitudes	Identify what factors influence hospital nurses' decisions to work during a pandemic	Hospital nurses report that their willingness to work in times of a pandemic is influenced by how well institutional policies ensure their own and their families' health and safety. Including personal protective equipment, education, and vaccination.

6	D'Antonio, P., & Whelan, J. 2004	Qualitative	Organisation Planning Staff Attitudes	Describe the historical role of hospital and public health nurses in times of disaster	Nurses played a crucial role in establishing health care systems in times of man-made or natural disasters to enable acute care and disease prevention.
7	Daugherty, E., Perl, T., Rubinson, L., Bilderback, A., & Rand, C. 2009	Quantitative	Education	Investigate ICU physicians and nurses' knowledge, attitudes, and expected behaviours during an influenza pandemic	Whilst 45% of the ICU health care workers correctly believed that a future influenza pandemic is highly possible, only 41% confidently reported sufficient knowledge of risks and strategies of personal protection.
8	Davey, V. 2007	Qualitative	Education Planning	Identify practices or actions essential in pandemic planning	Hospital pandemic planning is essential in risk management including educate frontline staff.
9	Department of Health UK 2012	Qualitative	Organisation Planning	Delineate the roles of public health, hospitals, and other stakeholders during a pandemic	Response plans must be drawn to delineate preparation in terms of beds, supplies, staffing, education, infection control, and coordination.
10	European Centre for Disease Prevention and Control 2015	Qualitative	Education Organisation Planning	Highlight the ECDC's advocacy for national pandemic preparedness	education policies are geared toward the public and health workers in general
11	Farrar, J. 2010	Qualitative	Education Organisation	Explore the impact of nursing leadership on resource allocation protocols in the ICU	There is lack of strong supporting evidence in the ICU setting regarding preparedness plans and protocols. Nurses must develop, test, and implement protocols by referring to current evidence and adhering to nursing ethics.

12	Jackobson, J. 2010	Quantitative	Education Staff Attitudes	Investigate the vaccination rates of hospital health care workers during the 2009 influenza pandemic	Vaccination rates among health care workers were low with strong resistance against mandated vaccination leading to some nurses initiating legal action. A contributory factor to resistance was the inadequate education.
13	Jackobson, J. 2009	Qualitative	Education Organisation	Identify key actions that school nurses need to do during an outbreak or pandemic	Timely and effective responses to an outbreak in schools require a knowledgeable, skilled, and sufficient school nursing workforce.
14	Johnson, V. 2009	Quantitative	Education Planning	Estimate the need for mortuary services during a severe pandemic	The increase in mortality associated with a pandemic can overwhelm mortuary services. Clear step-by-step actions that other stakeholders can easily adhere to once activated are necessary.
15	Kenneth, D. 2007	Qualitative	Education Work Ethics	Identify legislations that apply to the pandemic response in ICUs and the hospital setting in general	Pandemic response plans at any level must comply with laws and regulations such as the PPACA of 2010 to avoid litigation in relation to issues such as end-of-life decisions and early discharge from the ICU.
16	Kumar et. al. 2009	Quantitative	Education Planning	To characterise the clinical condition, needs, and outcomes of children hospitalised for influenza	The characteristics of critically ill paediatric patients during the last influenza pandemic that can guide response planning and education for the staff.

17	Martin, D., Brown, L., & Reid, M. 2013	Quantitative	Education Staff Attitudes Work Ethics	Identify what factors influence hospital nurses' decisions to work during a pandemic	A significant number of nurses report that their willingness to work in times of a pandemic is influenced by how well institutional policies ensure their own and their families' health and safety.
18	Ma et. al. 2011	Quantitative	Education Staff Attitudes Work Ethics	Ascertain the knowledge of ICU clinicians about H1N1 influenza and their preference to work or not during a pandemic	In China only 41.9% of ICU clinicians reported adequate knowledge on the H1N1 influenza. A high 82.3% reported willingness to work during an outbreak. Improving the delivery of educational programmes can help improve knowledge.
19	McGonagle, M. 2007	Mixed	Education	Ascertain the effect of pandemic preparedness education on hospital staff	The article advocates for hospital staff education as part of pandemic preparation as it results in empowerment and control in relation to infection prevention and allays fears associated with caring for patients with infectious disease.
20	Michael, M., Helm, E., & Graafeiland, B. 2009	Quantitative	Organisation	Identify vulnerable groups during a pandemic and effective preventive measures	Children are one of the highly vulnerable groups during a pandemic and warrant vaccinations as a preventive measure that will also protect other family members.
21	Molyneux, J. 2009	Qualitative	Education	Determine the safety of the H1N1 influenza vaccine and priorities in allocation during a pandemic	During a pandemic, healthcare workers must be the first to receive vaccines to ensure their safety and enable them to safely care for infected patients. The H1N1 flu vaccine is safe based on FDA standards.

22	Molyneux, J. 2010	Qualitative	Organisation	Explore the impact of the larger socio-political situation on pandemic responses at the level of government and hospitals	The political and economic situation during a pandemic affects the outcomes of responses as it influences government and institutional priorities in relation to the allocation of limited resources.
23	Nap, R., Andriessen, M., Meessen, N., Miranda, D., & Van der Werf, T. 2008	Mixed	Organisation	Create a model of health care demand during a pandemic and identify key strategies in the efficient use of resources	Modelling the possible evolution of a pandemic enables the prediction of staffing needs so that steps can be identified in securing human resources toward adequate service provision especially in the ICU.
24	New York City Department of Health and Mental Hygiene 2007	Qualitative	Education Organisation Planning Starr Attitudes Work Ethics	Identify the major responsibilities of health care workers during a pandemic	Primary care pandemic response plans include patient screening and isolation, staff compliance with infection control procedures; staffing and supply procurement, patient scheduling, and monitoring updates. Associated skills must be developed among frontline health care workers involved during a pandemic.
25	Palazzo, M. 2001	Qualitative	Education	Explore how critical care nurses can teach patients' family members in light of early discharge from the ICU during a pandemic	During a pandemic, teaching the patient's family in the critical care setting in every opportunity enables the continuity of patient care.

26	Parry et. al. 2011	Quantitative	Education Staff Attitudes	Investigate nurses' knowledge of disease risk and the effectiveness of vaccination; determine the intent to be immunised	Nurses' knowledge of their risk of contracting communicable illness and the effectiveness of the influenza vaccine is sub-optimal leading to 43.8% declaring their intent to receive the vaccine.
27	Payne, K., & Rushton, C. 2007	Qualitative	Work Ethics	Examine ethical dilemmas during a pandemic and possible ways of resolution	The study emphasised the ethical considerations during a pandemic
28	Skelton, A. 2006	Quantitative	Organisation Planning	Determine the economic impact of an influenza pandemic	The economic impact of an influenza pandemic relates to hospital care, medications, death, and loss of productivity because of absence from work among other perceived effects based on modelling analysis. Use of strategies to mitigate the impact requires a skilled health care workforce.
29	Sprung et. al. 2010	Mixed	Education Organisation	Synthesise expert opinion into recommendations for an ICU pandemic preparedness plan	The Delphi study identified recommendations that should be part of an ICU pandemic response plan and encompasses communication, coordination, human and material resources, task delegation, infection control, occupational health safeguards, triage, and staff morale. Education of personnel at leadership and direct care levels are warranted.
30	Stephens, P.		Organisation	Identify the strategies	Vaccination should not be the sole strategy for

	2013	Quantitative	Planning	that hospital nurses will employ during a pandemic	prevention albeit it is the most common based on nurses' responses. However, infection control procedures are equally important.
31	Tegtmeyer K., Conway, E., Upperman, J., & Kissoon, N. 2011	Qualitative	Education	Explore evidence-based practices in hospital clinicians' pandemic response education and training	Healthcare worker education and training must be guaranteed to ensure an effective hospital response to a pandemic. There are evidence-based educational tools that can be used towards this end.
32	Veenema, T., & Toke, J. 2007	Qualitative	Education Organisation Planning Staff Attitudes Work Ethics	Examine the AHRQ principles and recommendations for an effective hospital pandemic response	The AHRQ laid down the elements of preparing for a pandemic including the legal and ethical premise, actions to take when there is scarcity of resources, and the role of nurses in the response. Staff education is a key element to the response and must be structured via a curriculum.
33	Webb et. al. 2009	Mixed	Organisation Planning	Model an ICU service patient demand and service supply and demonstrate its use in the development of a pandemic response plan	It is possible to generate a description of the ICU admission, patient demographics, treatment needs, resource utilisation, and outcomes during a pandemic to evaluate the adequacy and appropriateness of responses.

3.1.2 Organisation

In the articles reviewed, the concept of "organization" in the context of nursing administration was used in 12 studies in relation to structures and underlying pandemic response operations that allow healthcare workers to respond systemically (Aschenbrenner, 2009; Department of Health UK, 2012; European CDC, 2015; Martin, Brown & Reid, 2013; Michael, Helm & Graafeiland, 2009; Ma et al., 2011; Nap et al., 2008; New York City DHMH, 2007; Stephens, 2013; Tegtmeyer et al., 2011; Webb et al., 2009; Sprung et al., 2010). However, the survey revealed that regardless of how employers encourage nurses to work by providing incentives, they would not respond systematically during a pandemic (Ma et al., 2011). The authors pointed out that adequate planning is necessary to resolve issues pertaining to staff knowledge and skills and staffing during a pandemic (Ma et al., 2011).

3.1.3 Planning

This concept was addressed in 12 of the quantitative and qualitative studies reviewed (Amaratunga et al., 2007; Davey, 2007; Department of Health UK, 2012; European CDC, 2015; Farrar, 2010; Johnson, 2009; Michael, Helm & Graafeiland, 2009; McGonagle, 2007; New York City DHMH, 2007; Payne & Rushton, 2007; Stephens, 2013; Veenema & Toke, 2007). Amaratunga et al. (2007), for example, discovered gaps in pandemic preparedness planning by the administration of three hospitals reviewed. These planning inconsistencies affect staff attitudes as well as adherence to work ethics. Whilst there are existing protocols regarding how health care workers ought to respond in a pandemic, inadequate planning strategies could create pandemonium rather than helping contain the outbreak or spread of disease (Department of Health UK, 2012; European CDC, 2015; Farrar, 2010; Michael, Helm & Graafeiland, 2009; New York City DHMH, 2007).

3.1.4 Staff Attitudes and Work Ethics

Several articles in this review addressed critical care nurse's attitudes and willingness to work during a pandemic. Eight articles (n = 8) discussed work ethics or staff attitudes as being important or positively associated with favourable healthcare outcomes during pandemics or similar events (Amaratunga et al., 2007; Aschenbrenner, 2009; Contrada, 2013; Daugherty et al., 2009; Jackobson, 2010; Ma et al., 2011; Martin, Brown & Reid, 2013; Parry, 2011). Amaratunga et al. (2007), in their qualitative study identified gaps between standards of pandemic

preparedness planning and hospital and health workers planning. These gaps were perceived as crucial to health safety as they influence employee response to a pandemic.

Similarly, Daugherty et al. (2009) revealed that knowledge of the outbreak itself affects staff attitudes towards treating patients in an ICU and 50% of respondents believed that pandemics are likely to occur without warning. Moreover, the respondents reported suboptimal knowledge about the risk of infection associated with particular diseases. The survey by Martin, Brown and Reid (2013) also revealed that nurses were less likely to participate in a pandemic response due to the risk of becoming infected and possibly exposing their families (Martin et.al, 2013). The authors suggested that learning from the successful responses to past pandemic outbreaks in other facilities would help allay fears and engender a more positive attitude toward pandemic response participation.

4. Discussion

Four themes emerged from the thematic analysis, namely staff attitude and work ethics, organisation, planning, and education. The themes are found to be relevant to the purpose and research questions of the study. Daugherty et al. (2009) found that less than 50% of hospital staff reported adequate knowledge of a pandemic response. Additionally, two studies revealed that despite extensive education programmes, nurses reported that due to lack of knowledge pertaining to the specific disease risks, they have not responded appropriately during a pandemic (Ma et.al, 2011; Parry et al., 2011). For example, in the case of healthcare workers in Chinese ICU's during the 2009 H1N1 influenza pandemic, the respondents expressed had attending a programme related to pandemics, however they also expressed insufficient knowledge of the H1N1 Influenza (Ma et.al, 2011). This points out the need not only for pandemic outbreak training but for the specific diseases as well.

The integrative review found a general lack of evidence-based knowledge and skills reported for managing a pandemic and shows that educational programs, whilst necessary, do not always address specific issues related to pandemic response. To develop an educational program there is a need of evidence-based knowledge in order to ensure proficiency among critical care nursing. Furthermore, according to Murray (2010) work ethics and staff attitudes toward high-risk situations could be improved through education.

While there are protocols observing how health care workers should respond in a pandemic, inadequate planning strategies could create chaos. For example, Contrada (2013), Jackobson (2010), Martin, Brown and Reid (2013), Molyneux (2009), and Parry et al. (2011) documented resistance to work during a pandemic that could be related to several factors including education, planning, staff attitudes and work ethics. This is a staff attitude that health care administrators must anticipate and address during pandemic preparation to ensure patient and staff safety and optimisation of human resources.

Understanding staff attitude and work ethics during a pandemic is essential as it promotes adherence to response protocols such as those that mandate personal protection, vaccination, and infection control (Daugherty et al., 2009; Jackobson, 2010; Ma et al., 2011; Parry, 2011; Stephens, 2013). If critical care nurses are reluctant about participating in the pandemic response, unwillingness to work can amplify the challenges created by the influx of very ill patients affected by the outbreak. Furthermore, healthcare administrators should always have an up-to-date, evidence-based, and efficient plan to protect not only the public, but health care workers as well (Amaratunga et al., 2007; Davey, 2007; Johnson, 2009; Veenema & Toke, 2007).

The studies of this integrative review also identified recommendations on what actions nurses and health care professionals in general are to take (Davey, 2007; Department of Health UK; NY DOH, 2007) and the roles they should play at different levels during a pandemic (Sprung et al., 2010; Stephens, 203; Veenema & Toke, 2007). Two studies elucidated on the legal and ethical guiding principles applicable during a pandemic (Kenneth, 2007; Payne & Rushton, 2007). Even though the value of hospital and critical care nurses' education was apparent in many of the articles reviewed (Amaratunga et al., 2007; Davey, 2007; Department of Health UK, 2012; Jackobson, 2010; McGonagle, 2007; Ma et al., 2011; Martin et al., 2013; Molyneux, 2010; Parry et al., 2011; Payne & Rushton, 2007; Stephens, 2013; Veenema & Toke, 2007), the integration of the knowledge and skills needed into the educational programmes was not discussed in-depth.

4.1 Limitations and Strengths of the LR

The main limitation of this IR is that one researcher conducted all the review process. In such a scenario the transparency of the decisions made could had been compromised. The strategies employed to minimise this problem include documentation of the search strategy, the

use of the PRISMA Flow Diagram for the selection process of the sample, as well as summarising the purpose and key findings of each selected study.

Integrative reviews may be preferred above other methods because researchers discovered that it is the only approach that creates opportunities for combining and exploring diverse methodologies such as both experimental and non-experimental research in a single study (Soares, Hoga & Silva, 2014). In this manner, an IR is able to capture the breadth of evidence on a particular topic rather than only those generated by higher quality research such as randomised controlled trials. The IR is especially useful when there are no studies with a higher level of evidence available but there are many studies that use exploratory and descriptive approaches such as in this case.

5. Conclusion

This integrative review investigated the literature on the knowledge and skills needed to prepare critical care nurses for an effective response to a pandemic outbreak. A total of 33 qualitative, quantitative, and mixed method studies were located. However, the review did not include any high level of evidence study. The analysis generated four themes: education, organisation, planning, and staff attitude and ethics. The themes affirm the importance and need of specialised education on pandemic preparedness. The most significant finding is the lack of definitive evidence supporting which knowledge and skills are keys to ensuring that critical care nurses can perform competently in the event of a pandemic.

6. Future Work

The knowledge gap identified by this review warrants further research to better assist hospital planners and leaders in addressing the educational needs of critical care nurses.

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