## Version

This is the Accepted Manuscript version. This version is defined in the NISO recommended practice RP-8-2008 http://www.niso.org/publications/rp/

## Suggested Reference

which has been published in final form at
http://onlinelibrary.wiley.com/doi/10.1111/j.1478-5153.2012.00520.x/pdf

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# NEW ZEALAND NURSES PERCEPTIONS OF CARING FOR PATIENTS WITH INFLUENZA A (H1N1)

## ABSTRACT

AIM: This study aimed to explore the perceptions of the highly specialised nurses who provided extracorporeal membrane oxygenation therapy for the mostly young and critically ill patients during the 2009 H1N1 pandemic.

BACKGROUND: The 2009 influenza A (H1N1) virus caused a global pandemic and also affected New Zealand during that winter. Nine H1N1-infected adult patients suffering severe acute respiratory distress syndrome were admitted into an intensive care unit of a large urban hospital for rescue extracorporeal membrane oxygenation therapy.

DESIGN: The study used a two-phase mix methods study design.

METHODS:  Phase one of the study involved five nurses attending a focus group interview to collect their views of the challenges and issues of caring for these patients. The results of the focus group were used to formulate the phase two survey. In total 25 eligible nurses were invited to complete an anonymous survey; 18 completed and returned surveys giving a 72% response rate.

RESULTS: The survey identified issues including the acuity and high mortality rate of those affected, nurses working in an isolated environment because of infection control requirements, limited support, and being asked to work extra shifts.

CONCLUSION: Despite these challenges, the nurses felt positive about their experience of caring for the H1N1 patients, and felt the experience advanced their skills and improved job satisfaction.

RELEVANCE TO CLINCIAL PRACTICE: For future pandemics this study identified the need for all staff to have: a basic understanding of extracorporeal membrane oxygenation; strengthen inter-professional collaboration and communication; provision for more support and recognition of these highly specialised nurses, along with providing regular pandemic updates and offering counselling services.

## INTRODUCTION

In the wintertime of 2009, the imported H1N1 virus severely affected some otherwise healthy young adults in New Zealand, who developed acute respiratory distress syndrome (ARDS) and needed extracorporeal membrane oxygenation (ECMO) treatment to save their lives. Intensive Care Unit (ICU) admissions requiring nurses who worked with these patients (ECMO nurses) faced the multiple challenges of exposure to the risk of infection, shouldering extra workloads and looking after this high needs group. This study aimed to explore the ECMO nurses' perceptions of caring for H1N1-affected patients, which may benefit future nurses, ICUs, healthcare providers and health policy leaders who have limited understanding of the challenges implicit in caring for patients during a pandemic.

## THE H1N1 INFLUENZA A PANDEMIC

The 2009 influenza A (H1N1) flu virus, which was first identified in Mexico (Centre for Diseases Control and Prevention, 2009a) and the United States (Centre for Diseases Control and Prevention, 2009b), caused a global pandemic and resulted in the virus spreading across more than 208 countries and territories and led to at least 12,799 deaths within the year (World Health Organisation, 2010). The H1N1 flu virus was a new strain spreading via human to human transmission, severely affecting some otherwise healthy young adults, with a rapid progression. From exposure the incubation period was one to four days (Hope and Huang, 2009). Infection with the H1N1 virus causes upper and lower respiratory tract inflammation and fever, in severe cases ARDS, which for requires ICU admission, mechanical ventilation, and even ECMO treatment (Extracorporeal Life Support Organization, 2010). ARDS is an acute hypoxaemic respiratory failure following a systemic or pulmonary infection. It is the most severe form of acute lung injury marked by "rapid onset of profound dyspnoea that usually occurs 12-48 hours after the initiating event" (McPhee and Papadakis, 2010, p. 291-292). The disease is characterized by inflammation of the lung leading to impaired gas exchange, hypoxaemia and frequently resulting in multiple organ failure. The condition usually requires mechanical ventilation and the reported mortality rate of ARDS is 30-40%, and up to 90% if sepsis occurs (McPhee and Papadakis, 2010).

New Zealand and Australia were among the first countries to report an initial outbreak, at the beginning of the southern hemisphere winter. The H1N1 influenza virus was brought into New Zealand by a group of high school students returning from Mexico in late April 2009 (Hope and Huang, 2009). In New Zealand and Australia it caused an approximately eight-fold greater number of confirmed cases per head of population than in the United States (Webb and Seppelt, 2009). The spreading of the virus in New Zealand resulted in a substantial increase in demand for hospital services; particularly intensive care admissions for ARDS which increased to 15 times higher than previous years (Cassie, 2010). The ICU beds occupied by pandemic flu patients was 7.4 beds per million inhabitants (ANZIC Influenza Investigators, 2009), which had a large impact on ICUs and workloads for ICU staff, particularly ICU nurses.

An Australian and New Zealand Intensive Care study reported that between June and August 2009, during the peak outbreak, a total of 856 flu patients were admitted to ICUs, with 722 confirmed to have the pandemic H1N1 strain, approximately two-thirds of whom needed mechanical ventilation. Of those, 68 adult patients were either infected with H1N1 or developed ARDS, and failed to respond to conventional mechanical ventilation, requiring advanced ECMO treatment (ANZIC Influenza Investigators, 2009). This was a novel and serious phenomenon.

**ECMO TREATMENT**

ECMO is the use of a modified heart-lung machine to simulate usual heart and lung function in patients with acute, severe, heart or lung failure (Extracorporeal Life Support Organization, 2010). In H1N1, lung function often stops for days or weeks, so patients are completely dependent on ECMO perfusion (Extracorporeal Life Support Organization, 2010). For H1N1 patients, ECMO is primarily used for treating this severe but potentially reversible respiratory failure. Lung function usually returned in one to two weeks, but for a

small proportion up to a month or more (Extracorporeal Life Support Organization, 2010). ECMO is often the last resort to treat severe ARDS patients due to the high mortality rate of about 50% (Extracorporeal Life Support Organization, 2010).

During the pandemic, the ECMO treatment for H1N1-affected ARDS was used in 15 ECMO centres in New Zealand and Australia, representing an incidence rate of 2.6 ECMO per million people (The Australia and New Zealand Extracorporeal Membrane Oxygenation (ANZ ECMO) Influenza Investigators, 2009). The group of patients affected were predominantly young adults with a median age of 34.4 years. The median duration of ECMO support was 10 days, with 48 out of 68 patients surviving to discharge from ICU (The Australia and New Zealand Extracorporeal Membrane Oxygenation (ANZ ECMO) Influenza Investigators, 2009). The use of ECMO for 2009 H1N1–associated ARDS among adult patients achieved an improved mortality rate of 21%, compared with previous studies reporting rates between 30% and 48% (The Australia and New Zealand Extracorporeal Membrane Oxygenation (ANZ ECMO) Influenza Investigators, 2009).

A group of ECMO nurses working in the New Zealand ICU/ECMO centre were among the responders to the 2009 influenza A pandemic. They played a key role in providing bedside care to these relatively young and very ill adult patients while directly exposed to this virus. To date there has been limited reports on nursing during this extremely challenging pandemic and this study aimed to address this gap by exploring the New Zealand ECMO nurses' perceptions of caring for patients with H1N1.

**METHODS**

The purpose of this study was to explore New Zealand ECMO nurses' views and experiences of looking after adult patients with influenza A, during the winter season of 2009. The study setting was a Cardiovascular ICU of the largest urban hospital, which was the only national referral centre for adult patients who needed ECMO treatment in New Zealand.

The study was designed with two phases: phase one was a focus group interview and phase two was a survey. The participants were registered nurses who worked in the ICU who had been trained in ECMO use before June 1st 2009, and who had been involved in looking after 2009 influenza A-affected adult patients. A total of 38 potential participants were identified in January 2010 and all were invited to participate. Of those 25 were eligible, seven had received their ECMO training after June 2009 and six were on leave. Hospital and regional ethics approval was obtained. Participation was voluntary, and participants were assured that information gathered during the focus group interview and survey would remain confidential.

In phase one, a qualitative approach was used to collect the views of a group of five ECMO nurses. The interview contents were digitally recorded and then transcribed. Data was coded and analysed using a grounded theory type approach and a four-step analysis technique based on the approach of Speziale and Carpenter (2007). The themes emerging from the focus group interview, in combination with available literature, were used to formulate the survey to assess the consistency of the views expressed in the focus group interview.

In phase two study, a quantitative approach was utilized to collect each ECMO nurse's response. The combination of a qualitative and quantitative approach is known to greatly

enhance the collection of complementary information (Schneider et al., 2003). A self-administered questionnaire was sent by mail and email to each eligible ECMO nurse and completion and return of the survey was taken as consent. The survey consisted of multiple-option format questions and questions using a 5-point Likert Scale; and in addition some participants added comments. Use of a scale allowed subjective feelings and attitudes to be calculated as quantitative data (Polit and Beck, 2008). For example, participants were asked to consider a statement, and indicate whether they 'strongly agree', 'agree', 'neutral', 'disagree' or 'strongly disagree' with it.

A pilot test of the questionnaire was conducted to assess face and construct validity, time required to complete the survey and after minor revision the survey was distributed to all potential participants in late 2010. Questionnaires were distributed to all 25 eligible participants and 18 were returned giving an overall response rate of 72%. Among the 18 returned questionnaires, 15 were fully answered with three completed and three had a few unanswered questions. The responses were collated and a spread sheet application (Excel) used to calculate the data.

**FINDINGS**

Table 1 presents a summary of their biographical characteristics. The age of the nurses ranged from 20 to 59 years with 11 (61%) aged between 40-59 years, with most (94%) having more than five years ICU experience, and 55% had more than five years ECMO experience.

Table 1:        Biographical characteristics of participating ECMO nurses (n=18).

| Variable | Years | n | Percent (%) |
|---|---|---|---|
| **Age** | 20-29 | 1 | 6 |
| | 30-39 | 6 | 33 |
| | 40-49 | 10 | 55 |
| | 50-59 | 1 | 6 |
| **Years of ICU experience** | 1-5 | 1 | 6 |
| | 6-10 | 4 | 22 |
| | 11-15 | 3 | 17 |
| | 16-20 | 6 | 33 |
| | 20+ | 4 | 22 |
| **Years of ECMO experience** | 1-2 | 5 | 28 |
| | 3-5 | 3 | 17 |
| | 6-10 | 8 | 44 |
| | 11-15 | 2 | 11 |

When asked about their overall experience of being an ECMO nurse during the 2009 influenza A pandemic almost three quarters of respondents felt positive or very positive (n=13) (Figure 1). However, there were two (11%) respondents indicating negative feelings and a further three (17%) who held neutral viewpoints.

Figure 1:        ECMO nurses overall experience during the 2009 influenza A pandemic (n=18).

**Challenges of the role**

Six specific challenges were identified by ECMO nurses from the focus group interview and survey participants were asked to rate the impact of these (Table 2). More than half of

respondents (61%) perceived a 'great or severe impact' from caring for these very sick patients. The impact of infection control requirements and wearing gowns and masks during a 12 hour shift was also rated highly with 56% finding this a 'great or severe impact'. The third most reported challenge was feeling overworked and tired with 50% rating this as having either a 'great or severe impact'.

Table 2: Impact of challenges faced by ECMO nurses (n=18).

| Reason | No impact | | Little impact | | Some impact | | Great impact | | Severe impact | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | N | (%) | N | (%) |
| Critical illness, prolonged stay and high mortality rate in the patient group | 1 | (6%) | 2 | (11%) | 4 | (22%) | 6 | (33%) | 5 | (28%) |
| Infection control (wearing gowns and masks for the 12 hour shift) | 0 | (0%) | 1 | (6%) | 7 | (39%) | 5 | (28%) | 5 | (28%) |
| Felt overworked and tired | 0 | (0%) | 1 | (6%) | 8 | (44%) | 7 | (39%) | 2 | (11%) |
| Isolated in a room | 0 | (0%) | 3 | (17%) | 7 | (39%) | 5 | (28%) | 3 | (17%) |
| The unknown aspects of the disease process and its treatment | 1 | (6%) | 4 | (22%) | 11 | (61%) | 2 | (11%) | 0 | (0%) |
| Fear of being infected | 2 | (11%) | 5 | (28%) | 10 | (55%) | 1 | (6%) | 0 | (0%) |

**Coping with isolation and infection control requirements**

Infection control to prevent the spread of H1N1 was crucial during the influenza A pandemic and as discussed above the nurses experienced an impact from needing to wear gowns and masks. Another related concern, was the infection control practices of other staff. When asked to rate their perception of infection control practice the ECMO nurses thought their own, and the other nurses practice were 'good' or 'very good' (Table 3). However, 55% of perfusionists, 50% of intensivists and 44% of registrars were considered to practice 'average' infection control. It is noticeable that 22% of nurses perceived 'very poor' infection control practice from intensivists.

Table 3: ECMO nurses' perceptions of infection control practice (n=18).

| Staff | Very Poor | | Poor | | Average | | Good | | Very Good | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | N | (%) | N | (%) |
| ECMO Nurses | 0 | (0%) | 0 | (0%) | 0 | (0%) | 12 | (67%) | 6 | (33%) |
| Other Nurses | 0 | (0%) | 0 | (0%) | 0 | (0%) | 12 | (67%) | 6 | (33%) |
| Intensivists | 4 | (22%) | 0 | (0%) | 9 | (50%) | 5 | (28%) | 0 | (0%) |
| Registrars | 1 | (6%) | 2 | (11%) | 8 | (44%) | 7 | (39%) | 0 | (0%) |
| Perfusionists | 0 | (0%) | 1 | (6%) | 10 | (55%) | 6 | (33%) | 1 | (6%) |

**Limited support**

ECMO nurses' need for support was identified as important from the focus group interview and the survey sought to clarify where ECMO nurses thought they had received support (Table 4). Participants perceived strong support reporting 83% support good or very good from both ICU and ECMO teams. In contrast, most (89%) reported poor support from hospital management (89% as very poor, poor or average, n=16).

Table 4 ECMO nurses' perceptions of sources of support (n=18).

| Staff | Very Poor N (%) | Poor N (%) | Average N (%) | Good N (%) | Very Good N (%) |
|---|---|---|---|---|---|
| ICU Team | 0 (0%) | 0 (0%) | 3 (17%) | 8 (44%) | 7 (39%) |
| ECMO Team | 0 (0%) | 0 (0%) | 3 (17%) | 4 (22%) | 11(61%) |
| Hospital Management | 2 (11%) | 4 (22%) | 10 (56%) | 2 (11%) | 0 (0%) |
| ECMO Nurses | 0 (0%) | 0 (0%) | 1 (6%) | 1 (6%) | 16(89%) |
| Other Nurses | 0 (0%) | 0 (0%) | 4 (22%) | 7 (39%) | 7 (39%) |
| Intensivists | 0 (0%) | 2 (11%) | 6 (33%) | 8 (44%) | 2 (11%) |
| Registrars | 2 (11%) | 2 (11%) | 9 (50%) | 5 (28%) | 0 (0%) |
| Perfusionists | 0 (0%) | 0 (0%) | 8 (44%) | 1 (6%) | 9 (50%) |

In terms of the support from the multidisciplinary team members, participants reported receiving good support from nursing staff and perfusionists, but indicated mixed feelings of support from doctors (intensivists or registrars). Table 4 shows that the majority of ECMO nurses (89%) felt they had 'very good' support from the other ECMO nurses, with 78% of ECMO nurses receiving 'good or very good support' from other nurses. Half of ECMO nurses (n=9) felt the support from perfusionists was 'very good' while 44% thought it only 'average'. As for the support from intensivists, 44% of ECMO nurses thought it 'good', with the same proportion considering their support 'poor or average'. Half of ECMO nurses perceived the support from registrars as 'average', while 28% perceived it as 'good', although 22% considered their support was 'poor or very poor'.

**Feeling Overworked**

The focus group interview highlighted that nurses able to care for these patients were requested to work extra shifts during the pandemic. The survey revealed that the majority of ECMO nurses (89%) reported having worked between one and ten extra shifts (n=16), with only two nurses (11%) not doing any extra shifts. The questionnaire listed six reasons identified in the focus group interview that nurses chose to do extra shifts and asked participants to rate the importance of each (Table 5).

Table 5:      Importance of reasons for ECMO nurses to work extra shifts (n=17).

| Reason | Not important N (%) | Little importance N (%) | Moderately important N (%) | Important N (%) | Very important N (%) | Not applicable N (%) |
|---|---|---|---|---|---|---|
| Felt it was my duty to work | 1 (6%) | 5 (29%) | 3 (18%) | 7 (41%) | 0 (0%) | 1 (6%) |
| Didn't want to let my colleagues down | 0 (0%) | 1 (6%) | 4 (23%) | 9 (53%) | 1 (6%) | 2 (12%) |
| Wanted to help the unit out | 0 (0%) | 0 (0%) | 3 (18%) | 10 (58%) | 3 (18%) | 1 (6%) |
| Wanted to care for the patients | 1 (6%) | 2 (12%) | 6 (35%) | 5 (29%) | 1 (6%) | 2 (12%) |
| I did it for the money | 3 (18%) | 3 (18%) | 2 (12%) | 5 (29%) | 4 (23%) | 0 (0%) |
| Felt I had ECMO skills others didn't have | 2 (12%) | 4 (23%) | 7 (41%) | 2 (12%) | 0 (0%) | 2 (12%) |

The findings show that 13 nurses (76%) considered it important or very important to do extra shifts to help the unit out; 10 (59%) felt it important or very important 'not to let their

colleagues down'; and a further nine (52%) did extra shifts for the money and ranked it as important or very important. In the open ended comments one nurse commented that "receiving numerous/repeated text messages looking for ECMO nurses to do overtime became very invasive of one's private life and was tiresome.''

**Benefits from being an ECMO Nurse**

While the above highlights challenges, there were also perceived benefits of being an ECMO nurse during the pandemic. Participants were presented with four statements and asked to rate their agreement with these (Table 6). Most participants (94%) indicated that they 'strongly agreed or agreed' that the experience during the pandemic advanced their ECMO practice. In addition, over half (55%) 'agreed or strongly agreed' that they achieved greater job satisfaction during this time.

Table 6: Nurses' perception of possible gains from being an ECMO nurse during the 2009 pandemic (n=18).

| Statement | Strongly Disagree | | Disagree | | Neutral | | Agree | | Strongly Agree | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | N | (%) | N | (%) |
| **Advanced my ECMO practice** | 0 | (0%) | 0 | (0%) | 1 | (6%) | 7 | (39%) | 10 | (55%) |
| **Achieved greater job satisfaction** | 0 | (0%) | 3 | (17%) | 5 | (28%) | 8 | (44%) | 2 | (11%) |
| **Helped change some aspect of ECMO protocol** | 0 | (0%) | 1 | (6%) | 9 | (50%) | 6 | (33%) | 2 | (11%) |
| **Progressed ECMO treatment in H1N1 patients** | 0 | (0%) | 7 | (39%) | 4 | (22%) | 5 | (28%) | 2 | (11%) |

While the experience gained during the pandemic was perceived to have benefits for the nurse as an individual the benefits for improving ECMO protocol or progressing treatment in H1N1 patients were less recognised. Half of the respondents held a neutral attitude towards the statement 'helped change some aspect of ECMO protocol'; and over half (61%) were either neutral or disagreed that their practice 'progressed ECMO treatment in H1N1 patients'.

**Improvements for future pandemics**

ECMO nurses were asked their views about the importance of six areas for improvement in the event of future pandemics that were identified from the focus group interview (Table 7). The four improvements considered most important were more support and recognition from the hospital management (considered important or very important by 94%); monetarily value ECMO nurses' contribution (important or very important by 78%); strengthen inter-professional collaboration and communication (important or very important by 72%) and 72% reported further education for registrars and non-ECMO nurses about ECMO care as 'important or very important'. Also considered important, but less so, were providing counselling services and updates about the pandemic.

Table 7:        Areas for improvement for future pandemics (n=18).

| Potential Improvement | Not important | | Little importance | | Moderately important | | Important | | Very important | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | N | (%) | N | (%) |
| Provide counselling services during and after the pandemic | 2 | (11%) | 5 | (28%) | 6 | (33%) | 3 | (17%) | 2 | (11%) |
| Timely and regular updates about the pandemic | 2 | (11%) | 3 | (17%) | 3 | (17%) | 8 | (44%) | 2 | (11%) |
| Educate registrars and non-ECMO nurses about ECMO care | 0 | (0%) | 2 | (11%) | 3 | (17%) | 6 | (33%) | 7 | (39%) |
| More support and recognition from the hospital management team | 0 | (0%) | 0 | (0%) | 1 | (6%) | 10 | (55%) | 7 | (39%) |
| Strengthen inter-professional collaboration & communication | 0 | (0%) | 0 | (0%) | 5 | (28%) | 5 | (28%) | 8 | (44%) |
| Monetarily value ECMO nurses' contribution e.g. increase hourly pay or provide a bonus | 0 | (0%) | 1 | (6%) | 3 | (17%) | 3 | (17%) | 11 | (61%) |

## DISCUSSION

The majority of ECMO nurses in this study were very experienced, with 94% having more than five years ICU experience. This relates to the training selection criteria set for ECMO nurse candidates which require that ECMO nurses have a strong clinical background.  ECMO was introduced to New Zealand in 1993, so 16 was the maximum possible years of experience in this area (Gini, 2010).  Most of the ECMO nurses in this study felt positive about their overall experience during the pandemic.  This positive finding may relate to the following two factors. One is that most nurses perceived this experience advanced their ECMO practice and they had an increase in job satisfaction.  Another positive finding of this study showed that most ECMO nurses rated the support received from staff highly; however, less support was noted from hospital management and registrars.

Given the nature of the pandemic it was not surprising that infection control was raised as a challenge and also as a separate issue.  This survey found half of the participants perceived some impact from their fear of being infected with the H1N1 virus. This result is different from the findings of two Singapore studies where being exposed and contracting potentially fatal infectious diseases was found to be one of the most prevalent fears among healthcare staff during the SARS and the avian influenza pandemic (Kwek et al., 2004, Wong et al., 2008).  The infection control protocols of working in an isolation room and having to wear protective gear caused stress.  In addition though, participants were concerned about the non-compliance with infection control practice would not only put them at risk but also risk other team members becoming infected with the contagious influenza virus.  This survey found that ECMO nurses thought the infection control practice was very good among all nurses, average among intensivists and perfusionists, and poor for registrars. The need for effective infection control practices by all members of the healthcare team is supported by recognized (Marshall et al., 2011).

The majority (89%) of ECMO nurses reported having worked extra shifts during the pandemic. This is much higher than a survey reported by Qureshi and his colleagues (2005) in New York City, which found that only 57% to 68% would be willing to work during a respiratory syndrome emergency.  The present study found a sense of loyalty and duty to the

unit and their colleagues, along with financial rewards as important motivators. This finding was similar to Ives et al. (2009), who found health professionals, including nursing staff, felt they had a duty to provide care to patients in the event of an influenza pandemic.

**IMPLICATIONS FOR PRACTICE**

A recommendation from this study is that other nurses and medical staff need to have education and understanding of how ECMO works and the considerations for patient care and safety. This knowledge is not the sole domain of the ECMO nurse, and providing such education could improve the support provided, working environment and relationships with other staff and management. In the event of future pandemics, consideration should be given to acknowledging and rewarding the highly specialized ECMO nurses who provide frontline care and are potentially putting themselves at risk of infection. In addition, there is a need for ongoing support for these nurses, and this can be enhanced by strengthening and improving inter-professional collaboration and communication. Findings from the initial focus group and later survey highlight the need for regular updates, and support such as counselling services, due to the high stress situation ECMO nurses work in for the duration of the pandemic.

**CONCLUSION**

This study used a two phase approach, with a focus group interview, followed by a survey with ECMO nurses within the largest urban hospital in New Zealand which provided adult ECMO treatment. The findings demonstrate that the highly specialized ECMO nurses are a group of mature and experienced ICU nurses who provided intensive care during the pandemic, despite specific challenges related to caring for a predominantly young and critically ill patient group. In addition to identifying their areas of concern and challenges some benefits of working during the pandemic were found, along with recommendations for further support and practice in the event of a future pandemic. This study provides useful insight into New Zealand ECMO nurses' perceptions of caring for H1N1-affected patients and the findings have implications for nurses, ICUs, healthcare providers and health policy leaders who may not have recognised the challenges of caring for patients during a pandemic. However, there remains a need for further exploration of this important topic and the impact on clinical care delivery.

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**IMPACTS**

WHAT IS KNOWN ABOUT THIS TOPIC: During pandemics ICU nurses may be caring for critically ill and infectious patients, yet there appears to be minimal research that explores the nurses' perception of working at these challenging times.

WHAT THIS PAPER ADDS: This study identifies the impacts and challenges New Zealand nurses faced when caring for patients requiring extracorporeal membrane oxygenation during the 2009 H1N1 pandemic and offers recommendations for future similar situations.

# REFERENCES

ANZIC Influenza Investigators (2009). Critical care services and 2009 H1N1 influenza in Australia and New Zealand. *The New England Journal of Medicine;* **361**: 1991-1993.

Cassie F (2010). Study confirms swine flu saw skyrocketing ICU admissions. *New Zealand Nursing Review;* **10**: 12.

Centre for Diseases Control and Prevention (2009a). Outbreak of swine-origin influenza A (H1N1) virus infection-Mexico. *Morbidity and Mortality Weekly Report;* **58**: 467-470.

Centre for Diseases Control and Prevention (2009b). Swine influenza A (HINI) infection in two children-southern California. *Morbidity and Mortality Weekly Report;* **58**: 400-402.

Extracorporeal Life Support Organization (2010). H1N1 information.

Gini N (2010). Green Lane ECMO Database. Auckland, New Zealand: Starship Children's Health.

Hope V & Huang S (2009). New Zealand Public Health Surveillance Report, Environmental Science and Research, http://www.surv.esr.cri.nz/PDF_surveillance/NZPHSR/2009/NZPHSR2009June.pdf Accessed January 30, 2012.

Ives J, Greenfield S, Parry JM, Draper H, Gratus C, Petts J, Sorell T & Wilson S (2009). Healthcare workers' attitudes to working during pandemic influenza: A qualitative study. *BioMed Central Public Health;* **9**: 1471-2458.

Kwek SK, Low BL, Ong TC, Chan K, L, Chow WM & Tang HK (2004). The psychological impact of SARS on health care providers. *Critical Care Shock;* **7**: 99-106.

Marshall C, Kelso A, McBryde E, Barr IG, Eisen DP, Sasadeusz J, Buising K, Cheng AC, Johnson P & Richards M (2011). Pandemic (H1N1) 2009 risk for frontline health care workers. *Emerging Infectious Diseases;* **17**: 1000-1006.

McPhee SJ & Papadakis MA (2010). *Lange 2010 current medical diagnosis & treatment.* San Francisco, CA: McGraw Hill.

Polit DF & Beck CT (2008). *Nursing research: Generating and assessing evidence for nursing practice.* Philadelphia: Lippincott Williams & Wilkins.

Qureshi K, Gershon RR, Sherman MF, Straub T, Gebbie E, McCollum M & al. e (2005). Health care workers' ability and willingness to report to duty during catastrophic disasters. *Journal of Urban Health;* **82**: 378-388.

Schneider Z, Elliott D, LoBiondo-Wood G & Haber J (2003). *Nursing research: methods, critical appraisal and utilization.* Marrickville, Australia: Elsevier.

Speziale HS & Carpenter DR (2007). *Qualitative research in nursing: advancing the humanistic imperative.* Philadelphia: Lippincott Williams & Wilkins.

The Australia and New Zealand Extracorporeal Membrane Oxygenation (ANZ ECMO) Influenza Investigators (2009). Extracorporeal membrane oxygenation for 2009 influenza A (H1N1) acute respiratory distress syndrome. *The Journal of the American Medical Association (JAMA);* **302**: 1888-1895.

Webb S & Seppelt IM (2009). Pandemic (H1N1) 2009 influenza ("swine flu") in Australian and New Zealand intensive care. *Critical Care and Resuscitation;* **11**: 170-172.

Wong TY, Koh GC, Cheong SK, Lee HY, Fong YT, Sundram M, Koh K, Chia SE & Koh D (2008). Concerns, perceived impact and preparedness in an avian influenza pandemic:A comparative study between healthcare workers in primary and tertiary care. *Annals Academy of Medicine;* **37**: 96-102.

World Health Organisation (2010). Pandemic (H1N1) 2009-update 82, http://www.who.int/csr/don/2010_01_08/en/index.html Accessed 30 January 2012.