Critical care patients’ experience of the helmet continuous positive airway pressure

Andrew Dimech

ABSTRACT
Background: Continuous positive airway pressure (CPAP) is a common treatment modality for acute respiratory failure (ARF) in critical care. Historically, a tight-fitting mask is used to provide respiratory support. This however is not without risks to the patient. The helmet CPAP is a new product that provides the same treatment with a different method of delivery. There is minimal evidence to date explaining the patient’s experience of the new helmet modality.

Aims and objectives: The aim of this research study is to explore critical care patient’s experience of helmet CPAP.

Design: A qualitative approach was taken utilizing descriptive phenomenological methodology. In order to obtain rich data, six interviews with cues provided the platform for data generation and collection. A thematic framework was utilized with emergent themes manually analysed using a constant comparative technique to express the experiences or phenomena of a particular event or experiences.

Findings/results: The overall experience was unique to each patient. The patients entrusted the health care team which made the experience more tolerable. Paradoxical themes were experienced during treatment. The themes included entrapment, confusion, helping me breathe, liberation, challenges, apprehension, relief, trust and endurance. The desire to survive the acute illness proved to be a driving factor.

Conclusion: The study has provided an insight into the patient’s experience of helmet CPAP in the critical care setting. The findings have provided a basis for policy and guideline development. It will also assist in developing future patient focused care.

Key words: Critical care nursing • Qualitative research • Respiratory therapies • Semi-structured interviews

RELEVANCE TO CLINICAL PRACTICE
Having an understanding of the patients experience will assist in the development and provision of health care locally, nationally and internationally as supported by the current government policy. Although the experience could be explored looking at the physical and psychological impacts upon the patient overall each patients experience was unique, interchangeable, contradictory and paradoxical at times. The physical impact may have diminished from the conventional face mask however the long-term effectiveness of the therapy and the patient experience needs to be further explored.

RATIONALE/BACKGROUND
Continuous positive airway pressure (CPAP) is a common non-invasive ventilation treatment modality for acute respiratory failure (ARF) in critical care and acute settings in the United Kingdom. Historically, CPAP has been administered using a tight-fitting mask to the face. The mask is lightweight and comprises a soft adjustable seal which attempts to reduce gas leakage and trauma (Antonelli et al., 2002; Chiumello et al., 2003; Roberts et al., 2008; Schönhofer et al., 2008). However, this is not always achieved with 7% of patients treated with non-invasive positive pressure ventilation for more than 72 h developing skin necrosis (Antonelli et al., 2002; Taccone et al., 2004) although new mask designs have reduced the incidence of facial pressure injury. Nasal pain and ulceration of the bridge of the nose also limit the use of the masks. The difficulty in fitting the mask correctly also contributes to the large proportion of CPAP and non-invasive ventilation failures (Patroniti et al., 2003; Fabrizio et al., 2005).

The helmet CPAP is a new product that provides the same treatment with a different method of delivery (Esquinas, 2010; Isgro et al., 2010). With no contact points on the patients face, skin breakdown is eliminated (Costa et al., 2005) and reduction in
gastric distension due to air swallowing has been reported in comparison to facial CPAP (Costa et al., 2005). Antonelli et al. (2002) found that the method was effective in treating hypoxemic ARF and it had better tolerance and fewer complications than facial mask CPAP. Although it demonstrated an improved tolerance and fewer complications it did not explore the patient’s experience. Effectiveness between the two approaches is comparable although there is minimal evidence to date explaining patient perception of the new helmet modality.

**AIM**
The aim of this research study is to explore critical care patient’s experience of helmet CPAP (Box 1).

**BOX 1 HELMET CONTINUOUS POSITIVE AIRWAY PRESSURE**
Helmet CPAP is a relatively new non-invasive form of ventilation used in the treatment for ARF. The research has shown that the patient’s experience varies however there are also common themes. Overall, the drive to survive critical illness is evident. It is important to understand the patients experience in order to deliver appropriate nursing care. Nursing staff knowledge and actions are important to ensure the overall experience of Helmet CPAP is manageable resulting in improved compliance.

**SAMPLE**
The participants in the study were patients on a critical care unit (CCU) within an acute specialist NHS Foundation Trust. The research site provides a service with a capacity for level 2 and level 3 patients undergoing respiratory or organ support across two sites. It was essential to recruit patients who had undergone experience to the study as the patient’s experience can only be depicted by the individual themselves (Denzin and Lincoln, 2005). All patients had a primary diagnosis of cancer and were receiving active treatment. A sample of six patients who had previously experienced helmet CPAP therapy in the ICU were selected. Four medical patients had a haematological disease and two surgical patients had solid tumours. All participants had been treated with the helmet CPAP, at some point, for a minimum of 12 h. Some patients commenced CPAP with a face mask and some straight onto helmet CPAP, this was determined by clinical need and not study design. The clinical need related to intolerance of the face mask or unsuitability due to anatomical facial changes that were disease related. The minimum age for each participant was 18 and they were approached to participate at a minimum of 5 days post-discharge from critical care where the use of sedatives and opioids used in critical illness had been ceased and they were nursed on a general oncology ward. All patients approached were able to give informed consent.

As there was limited time and a small number of eligible participants, all who consented were included in the study. Inclusion and exclusion criteria are outlined in Table 1. Helmet CPAP initially was not frequently used in the trust hence it was essential to include patients who had experience of the device within the time frame.

During the recruitment period eight patients were eligible, however, only six participated. The patient population approached included six males and two females. Two females did not consent to take part, so the sample was all male. The patients were medical or surgical admissions presenting with ARF or developing ARF secondary to health care interventions.

Recruitment for the study was initiated via the critical care outreach team (CCOT) 5 days post-discharge from the CCU. The researcher was not involved in the nursing care of potential patients within the CCU. This minimized the risk of bias or influence over responses. The CCOT informed any patient who met the inclusion criteria of the study, supplied the patient information sheet, and sought patient’s interest in the study and subsequently informed the researcher, who then approached interested patients. The researcher then discussed the study and answered any questions prior to gaining informed written consent.

**Table 1 Inclusion and exclusion criteria**

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<th>Inclusion criteria</th>
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<td>Over 18 years of age</td>
<td>Less than 18 years of age</td>
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<td>Patients with acute respiratory failure</td>
<td>Patients who receive CPAP therapy</td>
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<td>who require CPAP therapy</td>
<td>solely via a face mask</td>
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<td>Patients who receive treatment with</td>
<td>Patients who are unable to provide informed</td>
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<td>the helmet CPAP for 12 h or more</td>
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<td>Patients who are able to understand and</td>
<td>Patients who are unable to hear</td>
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<td>speak English</td>
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<td>Patients who survive their critical</td>
<td>Patients with learning disabilities</td>
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<td>illness and are able to provide informed</td>
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DATA COLLECTION METHODS

Data was collected utilizing loosely structured interviews. A phenomenological research interview is a data generating process that is purposeful (Lowes and Prowse, 2001). Interviews enable the researcher to gain an insight into the personal experience of the patient who also provides historical information.

Face-to-face interviews were digitally audio recorded with patients who had experienced helmet CPAP in the critical care environment. Interview cues guided the researcher. This method of data collection allowed the patient to let the agenda flow and hence providing a rich source of data. Planned broad interview topics enabled the interview to be open and discussion-like (Streubert Speziale and Rinaldi Carpenter, 2007). The interviews were conducted away from the critical care environment but within the Trust in a private relative’s area and lasted no longer than 1 h. This enabled the researcher to facilitate and uphold confidentiality and minimize distractions. Participants’ understanding of the medical terminology was established by the interviewer. All patients understood the term ‘helmet CPAP’ and could clearly identify the treatment.

Discussing the patient’s previous experience of critical illness in a critical care environment may be traumatic for some individuals (Eddleston et al., 2000), hence it occurred on the wards private relatives rooms. Before the interview commenced, the patient identified a person to call should immediate assistance be required for unresolved distress. Post-traumatic stress disorder (PTSD) has been reported in patients who have been critically ill and survived critical care (Eddleston et al., 2000; Jones et al., 2001). In order to address any potential issues raised during the interview process, literature on local and hospital counselling services were available and the researcher was vigilant for signs of PTSD such as flashbacks, nightmares and signs of intense distress when discussing the treatment that may require further intervention. The researcher had experience in PTSD in patients post-critical care.

In recent years, the critical care patients’ recall of events in the critical care environment and its potential psychological impact has become more widely studied (Jones et al., 1998; Griffiths and Jones, 2007). The patient was asked if they would like to see the helmet CPAP to assist in their memory recall. If the patient was distressed about the experience the helmet CPAP would not be shown. If the patient wished to see the helmet CPAP and then became distressed the device would be removed and the interview ceased or suspended. However, none of the patients described or showed distress and all wished to see the helmet CPAP.

ETHICAL CONSIDERATIONS

All information obtained was managed within a confidential manner in accordance with the Nursing and Midwifery Code of Professional Conduct (NMC, 2008). The ethical principles of beneficence and non-maleficence are important to safeguard the participants from harm (Parahoo, 2006). All data held was anonymized and held within a locked cabinet within the NHS Trust. Ethical approval was sought and obtained from the Local Research and Ethics Committee (LREC) and local trust Research and Development (R&D).

DATA ANALYSIS

The analysis utilized a thematic network approach ensuring that key themes were identified as well as ensuring that if a participant identifies a theme that is key to them that it was still be preserved. After the interviews and transcription, each interview was analysed for interrelated themes and insights (Gerrish and Lacey, 2006; Attridge-Stirling, 2007). Manual analysis was conducted and it illustrated common themes using quotations (Gerrish and Lacey, 2006).

A thematic network is a method of organizing a thematic analysis allowing salient themes to be unearthed from qualitative data that shares the key features of hermeneutic analysis. Thematic networks also aim to explore the significance of an idea or understanding of an issue (Attridge-Stirling, 2007). The network consists of a three-tiered web-like map which includes the basic theme, the organizing theme and the global theme. The analysis of the data may result in more than one thematic network as the global theme is the core of a thematic network (Attridge-Stirling, 2007).

The basic theme is derived from a simple characteristic of the data that needs to be read in context with other basic themes linked to a common organizing theme. The organizing themes are more revealing of the detail of the text that groups the main ideas of the basic themes. The global themes summarize or cluster the meaning of the subordinate themes therefore revealing the meaning of the text (Attridge-Stirling, 2007).

A number of strategies such as audit trail, reflexivity and validation by experts ensure rigour in qualitative research (Parahoo, 2006). Koch (2006), states that the rigour of a study may be established if the reader is able to audit the events, actions and influences of the researcher. The audit trail achieves transparency and helps to establish credibility showing a clear path (Wolf, 2003; Cutcliffe and McKenna, 2004). A research diary was utilized to record details and rationales of all actions and decisions thus supporting decisions made throughout the study. Guba and Lincoln (1989)
express that audit enables the documentation of the logic of process and method decisions.

Reflexivity is the acknowledgement of the researcher’s influence on the research process incorporating conscious reflection (Green and Thorogood, 2005; Parahoo, 2006). A reflective diary was completed to ensure reflexivity is addressed by acknowledging the researcher’s background and beliefs and how they may impact on the research.

The parallel criteria of a qualitative study judge goodness or quality. The criteria run in parallel to the traditional rigour criteria of internal validity, external validity, reliability and objectivity (Guba and Lincoln, 1989). In order to assess the ‘truth value’ or internal validity each transcript was offered to the patients to review after the interview. This enabled the patient to comment on how things really were during the treatment with helmet CPAP upon reflection of their interview. Two patients chose to review their interview and felt it was a true reflection of their experience.

FINDINGS/RESULTS
The themes revealed several areas that highlighted the patient’s experience. They include entrapment, helping me breathe, liberation, adaptation, resemblance, apprehensive anticipation, relief, trust, survivorship and confusing times. The overall global order resulted in physical and psychological themes.

The findings have been presented in themes that emerged from the patients experiences. This is evident in Figure 1 where it is shown how the global theme was achieved from the basic and organizing themes.

ENTRAPMENT
Throughout the interviews feelings of entrapment were described. Patient A described a battle with the treatment and expressed that he was ‘almost fighting for the . . .’ and continued to ask ‘please let me out.’ It was also evident that some patients found the enclosed space within the helmet CPAP difficult. Patient A also described ‘hated being constrained, trapped and totally enclosed.’

The environment within the helmet CPAP was also described as being ‘closed’ and ‘claustrophobic’ by Patient D.

The overwhelming feeling of entrapment continued to be expressed by Patient F with feelings of being ‘locked in somewhere . . ., restricted and there was no escape.’ Although this patient continued with the treatment he felt that he ‘couldn’t get out of it quick enough.’ The overall experience of being constrained or trapped was further exemplified when Patient B described feelings of being ‘all tied up’ and feeling that he was ‘gonna suffocate.’

Patient B continues to explain the challenging experience due to the enclosed temperature. ‘The problem I had is because of the temperature and the thing it steams up. When it steams up well the first week, the anxiety . . . the temperature, the sweat . . . all of that were causing problems.’

The humidity within the helmet CPAP made the experience for Patient D uncomfortable. ‘No sooner that I had put it on I ah . . . felt that it was very humid inside the helmet.’ He also explains ‘the high humidity in the helmet I found ah . . . quite oppressive and it was definitely the humidity that ah triggered off the feeling of ah being extremely uncomfortable.’ Patient D also likened the helmet CPAP to ‘sitting in a sauna and felt that within the helmet CPAP it warmed up and became humid very quickly.’ Patient F explained that ‘you get warm in there because there’s no breeze or anything on your face.’

CONFUSION
Some of the patients interviewed described confusing messages that they received from health care professionals during their treatment with helmet CPAP. Patient B found that in his experience some of the nursing staff did not explain the therapy and some seemed to lack knowledge in the management of the helmet CPAP. He explained that ‘only one nurse told me that ah . . . guy, if you don’t go with it for at least for half an hour before you open it up it doesn’t do you any benefit. I don’t think a lot of peoples know

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that... they just open and close the... as they wish.’ At times Patient B’s wife would visit and open the helmet CPAP. ‘I don’t think there is enough awareness of you know people. . . my wife would come and open it up!’ Patient B continued to describe that ‘different people have different opinion. You know there is not clear of oh no no you should take it off... yeah... nobody knows what it should be. You ask somebody and everybody gives you a different opinion.’

HELPING ME BREATHE
Overall all patients interviewed comment upon the environment within the helmet CPAP and its ability to help them breathe. Patient B explained that ‘the different levels... helps you to get more oxygen into your lungs’ and that the levels were ‘stretching your lung’ which would make him tired at times.

Patient B had been previously treated with the CPAP mask but found that the helmet CPAP was much more tolerable. ‘It was easier than...easier than the mask. Compared to this mask that (helmet CPAP) regulates the oxygen very well. It’s a... in terms of ah... other than you’re all tied up and so on... because it’s part of the ready flow of oxygen it’s much easier to breath rather than leaking here... leaking there and so on.’
The ability to continue with daily tasks and activities such as reading was important to patient B. ‘I could still read the paper and things through that... yeah so it made it much more easier.’ The freedom of breathing comfortably also continued to provide the basis for other themes.

LIBERATION
Patient C found the experience of wearing the CPAP helmet positive overall. He expressed that ‘it was very clean and very clear... when you had it on you hardly noticed it was on there and that he had no problem with it at all.’ He would also ‘forget it was on...’ Overall patient C felt that it was a beneficial experience. ‘Well I knew it was doing me some good cause you could just feel it and I think it really allowed them to control the atmosphere. . . I can’t think of anything adverse really about it.’

Patient D found that he had a reasonable amount of freedom which made his experience more bearable. ‘It wasn’t noisy like nebulizers and ah you were able to speak to people whilst you had it on... you know it really gives you a great deal of freedom in that point of view you know and I thought that was ah quite outstanding.’

A positive experience was also encountered by patient E. He described feeling ‘quite happy and quite comfortable.’ Patient E explained that during the treatment ‘you could have a drink as well.’ The experience for Patient E was good and he ‘found it really very comfortable’ and that the helmet CPAP was ‘a brilliant invention.’

TRUST
Whilst being treated with the helmet CPAP some patients explained that they commenced or continued treatment as they felt it was appropriate because of advice received from the health care professionals. Patient A explained that he carried on despite feeling ‘trapped’ and continued to state that ‘it had to be done’ and that choice was not an option. He felt that what was advised was the correct intervention despite his feelings. He had put his trust into the health care team and explained ‘now the doctor of course was very right in that he knew far more than I did.’

Patient F relinquished his independence and placed his trust in the health care professionals. He goes on to explain how he stated to the health care team ‘you know what you are doing!’ He has a perception that the direction from the health care team is in his best interest. He does however question the knowledge of all health care providers. ‘They’re supposed to know what they’re doing... but I believe in them so I let them carry on.’

It was evident that some of the patient’s were unable to comprehend their state of illness or the environment around them but continued to rely upon their trust of the health care professionals. Retrospectively speaking Patient A felt that he was ‘pretty confused at that stage.’ He acknowledged that he did not realize how ill he was at the time during the treatment, ‘I was obviously more ill than I realized.’ The patients felt vulnerable during this period. They continued with their treatment despite being unable to comprehend fully the extent of their illness. Patient B described himself as ‘being at my weakest stage.’ He also continued on with his treatment despite ‘not knowing what really is actually happening here.’

DISCUSSION
The themes revealed that the patient experience affected the patient either physically and/or psychologically. The themes reflect the overall experience of the patients interviewed. When collating the themes experienced in comparison to other patients, certain similarities were evident although each individuals experience was unique to themselves. It has been evident that the patients have the ability to focus on their current situation and the future (MacBr...
Many of the patients identified with their current situation whilst continually pursuing their goal of surviving. This was expressed on a day-to-day basis of adaptation to their environment in order to survive the treatment and helmet CPAP during this acute phase of their illness. Despite undergoing cancer treatment, no patients discussed or referred to any aspect of their cancer journey in the interviews, which was a surprising finding but could have been related to how they perceive the researchers' role or the intended research. However, the notion of surviving treatment and an acute event was evident in the patient's experience of helmet CPAP in the CCU.

At times hindsight bias occurred where an individual's or peoples inclination to change their perception once they have experienced or know the outcome of an event (Christensen-Szalanski and Fobian Willham, 1991). Some of the patients described the themes and then referred back and felt that this is what would be expected any way. The judgements are made with the benefit of feedback about the outcome of an event or experience (Hoffrage et al., 2000). Previous experience or knowledge of an event can affect the overall outcome or understanding. This has been seen with medical staff who apply previous knowledge and experiences to aid in decision making and support diagnosis (Dowie and Elstein, 1999).

Some patients, particularly Patient A, disliked the helmet CPAP and throughout the interview he expressed his desire during the treatment to be released from the helmet CPAP on several occasions. Once the treatment was completed looking back on the experience it was described as not being as bad as it was thought at the time. The patients feeling of relief once the treatment was completed was evident. In hindsight some felt that the experience was tolerable and others felt that it was unbearable at times however, generally it was an experience that they would not like to have to encounter again.

Limitations of the study and the researcher were evident. The novice researcher, gendered sample and recruiting challenges were highlighted. As a Masters of Science (MSc) student the researcher was a novice. This may have impacted upon the questioning techniques and style. Conducting a rigorous interview is complex and requires skills such as listening and not leading participants towards particular views or beliefs (Gerrish and Lacey, 2006). Guidance and support from a senior lecturer and supervisor minimized the potential impact of the novice researcher.

The study was open to both males and females however only males participated in the study. This was unintentional however this may have affected the outcome of the results as the experiences of females were not represented. Polit and Beck (2009) have explored the historical bias towards male participants in medical research in the past with a bias towards female participant in nursing research. It is evident that gender is an important issue that requires consideration. All potential participants were approached in the same manner by independent nursing members from the CCOT. The members of the CCOT who assisted in the recruitment process were all female. All participants also had a diagnosis of cancer. It is not known what impact this may have had on the outcome of the findings. It is also important to recognize the study was limited to one hospital and patient group.

**IMPLICATIONS FOR PRACTICE**

The findings of the study further support the role that the patient’s experience has in health care and health care provision as supported by Lord Ara Darzi and the Department of Health (2008). In relation to local policy and guidelines further education and training will be conducted to minimize the mixed messages given by nursing staff in particular in the management of the helmet CPAP. A greater understanding of patients’ experience will alter clinical behaviour such as placing the helmet CPAP out of direct vision from the patient whilst it is not used to minimize the psychological impact upon the patient, potentially avoiding provoking apprehensive anticipation. Table 2 presents further recommendations for clinical practice. The findings may also be applicable to other clinical settings and trusts where helmet CPAP is utilized.

The study highlighted broader implications transferable to the wider critical care environment such as understanding the patient experience of critical care interventions. This may also be pertinent in the training and ongoing updates that health care professionals receive in regards to equipment utilized in their environment. An assumption can be made that if staff have used equipment that they are always fully aware of its use, impact and limitations. Placement of the helmet CPAP for example, whilst not being used for treatment should be stored away from direct view of the patient.

<table>
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<th>Table 2 Clinical recommendations for practice</th>
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<td>• Further education and training for nursing staff around the experience of helmet CPAP and how to use helmet CPAP</td>
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<td>• Guided explanation of treatment to patients</td>
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<td>• Information sheet about helmet CPAP and what it is, why it is used etc., for patient, family, significant others</td>
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<td>• Headphones to attach to television to be worn during treatment</td>
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<td>• Placement of unused helmet CPAP behind patient</td>
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<td>• Ensure a care plan is in place for helmet CPAP</td>
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to minimize the psychological impact upon them leading to anticipatory apprehension. The findings may be applicable to other non-invasive ventilation modality’s where the helmet is used.

CONCLUSION

This study has highlighted the critical care patient’s experience of helmet CPAP. The research methodology of phenomenology has enabled a rich source of information in regards to the patient’s experience. The descriptive approach has enabled the patients to express their feelings, understanding and overall experience of a relatively new device in the treatment of ARF. The value of this methodology has been shown which will continue to enhance and guide care from the patient’s perspective.

Having an understanding of the patients experience will assist in the development and provision of health care as supported by current government policy. Although the experience could be explored looking at the physical and psychological impacts upon the patient overall each patients experience was unique, interchangeable, contradictory and paradoxical at times. The physical impact may have diminished from conventional face mask however the long-term effectiveness of the therapy and the patient experience needs to be further explored.

WHAT IS KNOWN ABOUT THIS TOPIC

- Helmet CPAP is a relatively new non-invasive form of ventilation used in the treatment for acute respiratory failure.
- Historically, CPAP has been administered using a tight-fitting mask to the face.
- The difficulty in fitting the mask correctly also contributes to the large proportion of CPAP and non-invasive ventilation failures.
- Helmet CPAP has less physiological side effects than conventional face mask CPAP.
- Effectiveness between the two approaches is comparable although there is minimal evidence to date explaining patient experience of the new Helmet modality.

WHAT THIS PAPER ADDS

- The research has shown that the patient’s experience varies however there are also common themes.
- The themes include entrapment, confusion, helping me breathe, liberation, challenges, apprehension, relief, trust, endurance and experience.
- Overall, the drive to survive critical illness is evident.
- It is important to understand the patients experience in order to deliver appropriate nursing care.
- When not in use, the Helmet CPAP equipment should be stored away from the patient.
- The findings suggest that nurses involved in the care of patients requiring Helmet CPAP may have different levels of knowledge.
- Nursing staff knowledge and actions are important to ensure the overall experience of Helmet CPAP is manageable resulting in improved compliance with an emphasis on standardized education and guidelines.

REFERENCES


Critical care patients’ experience of helmet CPAP


