

### SPECIAL SUPPLEMENTS

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From multiple organ support therapy (MOST) to extracorporeal organ support (ECOS) in critically ill patients, *C. Ronco et al.*

Chronic respiratory dialysis, *D. Abrams et al.*

Understanding LVAD & artificial hearts, *N. Aissaoui et al.*

## PLUS

CO<sub>2</sub> in the critically ill, *L. Morales-Quinteros et al.*

Immune dysfunction in sepsis, *V. Herwanto et al.*

Hypothermia in neurocritical care patients other than cardiac arrest, *R. Helbok & R. Beer*

Intracranial pressure monitoring devices, *S. Patil & F. Fadhilillah*

Complications of decompressive craniectomy in neurological

emergencies, *J. Gonzalez*

A novel communication device for tracheostomy ICU patients, *F. Howroyd*

The Critical Care Resuscitation Unit, *L.I. Losonczy et al.*

Variation in end-of-life care, *A. Michalsen*

Simulate or not to simulate? *M. Poggioli et al.*

Being an expert witness, *J. Dale-Skinner*

Role of the chaplain in the ICU, *K. Jones*

Developing new approaches to patient safety, *J. Welch et al.*

How to provide better intensive care? *J. Takala*

Caring for critically ill immunocompromised patients, *E. Azoulay*



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# Supporting the patient innovator

## Developing a novel communication device for tracheostomy patients in the intensive care unit

Their inability to communicate effectively whilst he had a tracheostomy on the intensive care unit (ICU), had such a profound impact on Duncan Buckley and his wife, Lisa-Marie, that they developed a concept for a novel interactive communication device, called 'ICU CHAT'. Together, they have been embedded within the multidisciplinary ICU research team at the Queen Elizabeth Hospital Birmingham (QEHB), supported by the Human Interface Technologies team from the University of Birmingham, and funded by the National Institute of Health Research Surgical Reconstruction and Microbiology Research Centre, to further develop their prototype for clinical trial.

*"In our experience (Duncan & I), we found it very frustrating to not be able to communicate in any way with each other and staff. I made a cardboard alphabet board which helped but it was extremely long winded and in itself frustrating to work with."*

Lisa-Marie Buckley: Wife of Duncan, University Hospitals Birmingham (UHB) ICU survivor.

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### Communication in the ICU

Patient communication in the ICU is a widely recognised challenge, causing frustration for patients, relatives and staff (ten Hoorn et al. 2016). Due to the presence of artificial airway devices, such as a tracheostomy, patients are often voiceless as airflow bypasses the vocal cords and inhibits speech.

This is often combined with the profound weakness or injury associated with critical illness, therefore limiting other non-verbal forms of communication, such as writing or lip-reading (Muthuswamy et al. 2014).

**▲ this early translational research demonstrates the ability of clinical and academic teams to support potential patient innovators ▼**

'Voicelessness' is considered to have both short- and long-term consequences for the patient, including stress, anxiety and social isolation, which are predisposing traits of post-traumatic stress amongst ICU survivors (Wade et al. 2012). It is therefore necessary that methods of communication are developed in order to improve the patient experience in the ICU in addition to patient outcomes.

### Augmented and alternative communications (AAC) devices in the ICU

AAC is a broad term for any method, technology or tool used to overcome barriers to communication. Although there are a range of AAC devices available on the market, none of those identified in the literature have been designed specifically for use in the ICU and therefore have limited transferability to this complex and challenging environment (ten Hoorn et al. 2016). Low technology AAC, such as alphabet boards, are often easily accessible and low cost. However, despite their convenience, low-tech AAC have variable success depending on the physical and cognitive ability of the patient recovering from critical illness and the time constraints and skill of staff (Patak et al. 2004). High technology AAC is a broad and advancing area, yet the available literature identifies practical and financial limitations to use in the ICU (ten Hoorn et al. 2016). The current literature does not explore factors relating to AAC requirements or usability specifically for alert and transiently voiceless tracheostomy patients in the ICU.



team at QEHB. By combining usability assessment with multidisciplinary team qualitative appraisal, the appropriateness of the system components were developed to ensure safety, practicality and low cost for use in the ICU. Following a human-centred design process and rigorous bench testing, the ICU CHAT device was developed (BSI 2010; IEC 2007).

**ICU CHAT feasibility study**

The multidisciplinary ICU research team at QEHB developed a clinical trial protocol to evaluate the usability and user acceptance of ‘ICU CHAT’ by patients, staff and relatives at QEHB’s ICU. The mixed methods trial design aims to collect quantitative data on usage and performance alongside qualitative appraisal to explore user experiences. The trial *Feasibility of the use of a novel interactive communication device, ICU-CHAT, for patients with tracheostomy on the ICU* has secured Health Research Authority permissions and is open to recruitment at QEHB. This early translational research demonstrates the ability of clinical and academic teams to support potential patient innovators, whose reflections on experiences during their ICU stay enable technology development to be truly patient-centered. ■

**Patient-centered design process**

The novel ‘ICU CHAT’ software design, developed by Duncan and Lisa-Marie, has been developed for use by ICU tracheostomy patients, with restricted upper limb function. The use of facial gestures enables

the user to control an on-screen cursor with their head movement, selecting phrases with vocal output. This novel and exciting idea was immersed by the Human Interface Technologies team from the University of Birmingham, alongside the ICU multidisciplinary research

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