**Abstract**

*Background:* Quality improvement (QI) is a way in which health care delivery can be made safer and more effective. Various models of quality improvement methods exist in healthcare today. These models can help to guide and manage the process of introducing changes into clinical practice.

*Aims and Objectives*: The aim of this project was to implement use of a delirium assessment tool into three adult critical care units within the same hospital, using a QI approach. The objective was to improve the identification and management of delirium.

*Method*: Using the Model for Improvement framework, a multi-disciplinary working group was established. A delirium assessment tool was introduced via a series of educational initiatives. New local guidelines regarding the use of delirium assessment and management for the multi-disciplinary team were also produced. Audit data were collected at six weeks and five months post implementation to evaluate compliance with use of the tool across three critical care units within a single hospital in London.

*Results*: At six weeks, in 134 assessment points out of a possible 202, the tool was deemed to be used appropriately, meaning that 60% of patients received a timely assessment. 18% of patients were identified as delirious in audit one. Five months later, only 95 assessment points out of a possible 199 were being appropriately assessed (47%), however, a greater number (32%) were identified as delirious.

*Conclusions*: This project emphasises the complexity of changing practice in a large busy critical care centre. Despite an initial increase in delirium assessment, this was not sustained over time. The use of a QI model highlights the continuous process of embedding changes into clinical practice and the need to use a QI method which can address the challenging nature of modern healthcare.

*Relevance to practice:* QI models help to guide changes in practice. Careful consideration should be given to the type of QI model used in any project

**Introduction**

Internationally, healthcare organisations are under increasing pressure to manage resources more effectively and efficiently (The Health Foundation HF (2015) and Intensive care units (ICUs) consume a large proportion of healthcare budgets. Quality Improvement (QI) programmes have come to represent an effective way to deliver safe, evidenced based care and it is important that ICUs demonstrate a commitment to their use. Poor quality care can be costly and harmful to patients, and can undermine public confidence in Health Care Professionals (HCPs) (Chelluri 2008).

Improving the identification and management of delirium is a priority area for critical care practice. International studies (Ouimet *et al*. 2007, Salluh *et al*. 2010,) identify it as a serious and common event with reported incidence ranging from 16-89%, and higher rates commonly noted in mechanically ventilated patients (Agarwal *et al*. 2010). Numerous studies have demonstrated an association with increased mortality and length of hospital stay and a decrease in long term cognitive function (Ely *et al*. 2004, Serafim *et al*. 2012, Parinprhaide *et al*. 2013, Klein *et al*. 2014, Mehta *et al*. 2015).

In the United Kingdom (UK), NICE (2009) recommend use of either the Confusion Assessment Method- Intensive Care Unit (CAM-ICU) tool (Ely *et al*. 2001) or the Intensive care delirium screening checklist (ICDST) tool (Bergeron *et al.* 2001) to assess for delirium. Despite national agreement that all critically ill patients should be assessed for delirium (NICE 2009, Page 2010), ICUs often struggle to implement screening and management strategies (Devlin *et al.* 2008, Riekerk *et al.* 2009, Brummel *et al.* 2013). This has been attributed to a number of factors including challenges related to assessing and diagnosing patients unable to verbalise (Brummel *et al*. 2013, Ely *et al*. 2014, Naidech *et al*. 2013). The delirium screening tools that are available can also be perceived as complex and time consuming to implement in daily practice (Riekerk *et al.* 2009).

To address this complex but important area of critical care practice, this paper reports on the use of the Model for Improvement (Institute for Healthcare Improvement IHI 2018) to implement delirium screening into a large critical care unit, which specialises in major trauma.

**Background**

Quality improvement is a continuous, proactive approach to improve processes and systems as opposed to quality assurance, which focuses on measuring compliance with agreed standards (Healthcare Quality Improvement Partnership HQIP 2015). The Health Foundation (2015) defines QI as a process through which an organisation or department can improve an aspect of patient care. The Institute of Medicine (IOM) (2001) further note that QI can support safe, timely, effective, efficient, equitable and cost effective care. These dimensions are widely accepted in healthcare to represent excellence (Curtis *et al.* 2006).

Quality improvement Models offer a systematic, formal framework for establishing QI processes in practice (IHI 2018). Most were developed initially in industry settings, to monitor and improve processes contributing to the provision of poor services/goods (IOM 2001), but have since been adapted and applied to the provision of healthcare services. A number of different Models exist including LEAN, Six sigma and the Model for improvement (HQIP 2015, IHI 2018), however, they all share the same underlying principles and key steps. These include the use of a continuous process, which seeks to engage key stakeholders; understand the problem; identify solutions; test small changes and spread change (HQIP 2015).

**Purpose**

The aim of this quality improvement (QI) project was to introduce the use of the CAM-ICU delirium screening tool into a large Central London critical care unit.

**Rationale**

The project was triggered by a practice development nurse who noted that a change to current practice was necessary to meet national recommendations for best practice around delirium assessment and management (NICE 2009). Due to its large evidence base (Ely et al. 2001, Mitasova et al. 2012, Truman et al 2003, Wong et al 2010), CAM-ICU was selected as our delirium assessment screening tool. The CAM-ICU tool was originally developed and validated by Ely et al. (2001). It was adapted from established delirium criteria in the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) (2000) and is designed for use in non-verbal patients (Ely et al. 2001). CAM-ICU also incorporates an assessment of the patient’s sedation and agitation level using the Richmond agitation and sedation score (RASS) (Sessler et al. 2002), a tool already used across the three ICUs in the trust.

**Methods**

The project was guided by the Model for Improvement, which incorporates the Plan, Do, Study, Act (PDSA) framework (IHI 2018). This method was chosen as it allows the introduction of small scale changes and the opportunity to evaluate and learn from each step. The Model for Improvement is described as being a simple yet powerful tool for accelerating improvement, which has been successfully used by hundreds of health care organisations internationally (IHI 2018).

As a QI project with no experimental component ethical approval was not necessary. The project was, however, registered with the critical care policies and procedures committee of the hospital trust.

**Team Formation**

The setting for this project was a critical care unit in a large central London Hospital. The unit has three adult ICUs and a total of fifty beds. It provides for a general medical and surgical population and is a major trauma centre offering specialist neuro-trauma care.

The project team included nurses and doctors from the local dementia and delirium team, an ICU practice development nurse, pharmacists, ICU consultants and three ward nurses appointed as delirium champions. The project team was established and chaired by a practice development nurse with a specific interest in assessing and managing delirium in critically ill patients. Stakeholder engagement is key to successful QI (HQIP, 2015). Therefore it was very important to include recognised experts in the field of delirium and for a wide range of disciplines to be represented on the delirium working group. Clinical frontline staff were represented within the group as clinicians, but also provided a source of information and wider feedback to the group.

**Setting aims and timelines**

The project team agreed that the primary aim would be to successfully implement daily delirium screening in each critical care unit within six weeks and that this change would be sustained five months later. A secondary aim was to improve the identification and subsequent management of delirium across all the trust. No timeline was set for this ongoing long term goal.

**Selecting, testing and implementing changes**

Changing ingrained behaviour is challenging and is not dependent on an individual professional’s behaviour change but on the collective action of healthcare professionals (Johnson *et al*. 2015). A number of key interventions were agreed to encourage and support staff behaviour change.

*Developing a guideline for practice*

New delirium guidelines were collaboratively written by the established Multi-Disciplinary Team (MDT). The guidelines were based on national recommendations and included information on the use of the CAM-ICU tool and hints and tips regarding delirium assessment (Barr *et al*. 2013, Devlin *et al*. 2011, Reade *et al*. 2014). They also included information on how to manage and treat patients with delirium. Finally a section regarding patient discharge and details of the referral system to the Dementia and Delirium (DAD) team was included. These guidelines were approved by the hospital’s policy and practice forum.

*Education and awareness*

Ely et al. (2014) recommend a short period of training and education with all staff who will be using the CAM-ICU tool. NICE (2007) also acknowledge that awareness and knowledge are vital first steps in changing practice justifying the focus on staff education. Our aim was not only to make staff aware of the need to change practice but also to provide them with the skills and knowledge to be able to effectively challenge their own and others’ practice. We undertook an initial one week education drive, followed up with further sessions.

The education programme included a short presentation on delirium and common symptom presentations; a discussion around the CAM-ICU tool and provision of a key card copy. This key card copy is a laminated information card which can be attached to all staff identification badges. This is used as a quick reference guide. Staff were also shown a short video of a patient’s delirium experience in one of the local units.

The education programme was predominantly delivered to nursing staff as they were identified to be the main users of the CAM-ICU tool. Other members of the team such as therapists, pharmacists and medical staff were also invited to attend these education sessions as they are also able to utilise the tool albeit less frequently. The short term aim was to train as many nurses, doctors and allied health professionals as possible in the initial timeframe of six weeks.

To address the longer term aim to train all 450 nurses sessions were included on all mandatory training days and as part of the in-house ‘introduction to critical care course’, completed by all nurses new to the speciality. It was acknowledged that therapists and medical staff could also use the tool, thus additional specific training sessions for these staff were also provided.

In addition to the above education programme, an awareness week aimed at nurses, doctors and allied health staff was held across the three critical care units. The event took place in the staff room of each of the three units during lunchtime every day. A member of the delirium working group was present for a short talk on delirium assessment. Participants were invited to take part in quizzes, with sweets and vouchers used as prizes. An education board and demonstrations of how to use CAM-ICU were also provided and frequently asked questions were displayed on a poster.

*Prompts*

A copy of the CAM-ICU assessment tool was included in all nursing documentation and care plans. A question prompt was also added to the doctors’ daily ward round forms. Posters advertising the awareness week and containing details of how to access and use the new guidelines were displayed in all unit coffee rooms and staff bathrooms. The new guideline was available via the local online guideline bank accessible from every computer in all three ICUs. A printed copy was also inserted into each local guideline book for use if computer systems became unavailable.

**Establishing measures and testing changes**

It was agreed that as a standard all patients would be assessed using CAM-ICU if they had a RASS score of minus three and above (Ely et al. 2001). Based on recommendations from HQIP (2015), a clinical audit was chosen to assess compliance with the use of the CAM-ICU tool.

A paper audit tool (see figure 1) was designed by the delirium working group and adapted using guidance from NICE (2010). Audit data were collected six weeks after the launch of our education and awareness programme and again five months later. Data were collected from all patients across the three ICUs for a period of seven days by a member of the delirium working group. No baseline data were collected as CAM-ICU was not used to identify delirium prior to this project.

We collected data on which patients were assessed using CAM-ICU and the reasons for not using the assessment tool. We included the option of ‘no’ or ‘not applicable’ to distinguish between those patients who could have been assessed but were not and those patients who could not be assessed. To help us to understand the reasons for not carrying out a delirium assessment and to enable us to focus our training/teaching on these areas, we left a small comment box for auditors to record the reason for the ‘no and ‘not applicable’ options. The number of patients assessed as positive for delirium using CAM-ICU was also recorded. Following modification of treatment guidelines, data relating to delirium treatment were additionally included in the 2nd audit.

All data were analysed using Microsoft Excel and are reported descriptively using raw data and percentages.

*Audit Results*

During audit one, 298 potential assessment points were audited. On 202 occasions a delirium assessment should have been carried out (based on the patient’s RASS), but an assessment was only documented on 134 occasions. Across the three units, only 60% *(134/202)* of all patients were actually assessed for the presence of delirium. Out of the 134 assessments, delirium was present in 18% (*24/134)* of assessed patients.

At the five month point, 282 potential assessment points were audited. On 199 occasions a delirium assessment should have been carried out (based on the RASS). Delirium assessment was carried out on 95 occasions. This means that, across the three units, 47% of all patients were actually assessed for the presence of delirium. Out of the *95/199* assessments, delirium was present in 32% (*30/95)* of patientsassessed, an increase from the 18% identified in audit one.

An overview of key results are presented in **Table 1 pg. 13**. Results are divided into the three ICUs, Unit A, Unit B, and Unit C. Compliance reduced in all three units between audit one and audit two. Unit C in particular had very poor compliance rates dropping from 43% *(23/53)* in audit one to 35% *(23/65)* in audit two. Unit A had the largest drop in compliance, from 85% *(75/88)* in audit one to 49% *(33/67)* in audit two.

Additional information collected in audit two revealed that a number of patients who were documented as not appropriate for a CAM-ICU assessment were in fact receiving treatment for delirium.

**Discussion**

The aim of this QI project was to implement delirium screening into a critical care unit. We know from the literature that it is possible to successfully introduce CAM-ICU into a busy ICU (van de Boogaard et al. 2009, Maarten et al. 2009, Page et al. 2009). Devlin *et al.* (2007) report, however, that common implementation problems include lack of staff knowledge, individual unit barriers, time constraints and difficulty in using available assessment tools.

We did manage to successfully introduce CAM-ICU across all three ICUs and based on our audit results, our compliance rates are very similar to other comparable units (Musolf *et al.* 2016). There was no routine delirium assessment in place prior to this project and so even the disappointing audit two results represent a significant improvement for the three ICUs.

Although the relatively poor rates of compliance observed in the first audit were expected, the delirium working group were surprised and disappointed to find that the second audit showed worsening results. False initial increases in compliance are common due to a heightened awareness of the project and the presence of observers/auditors (Pun et al. 2005). Compliance rates could also have been affected by the differing levels of project support in each unit.

No data were collected about the acuity level of patients across the three units, a factor which may have impacted results. Differences between units may also be explained by the characteristics of each population group. For example, unit C admits a greater proportion of patients with neurological injuries. In a neuro-trauma centre there may be difficulty in distinguishing between symptoms associated with head injuries and the symptoms of delirium. In hindsight this was a barrier to the implementation of delirium screening on this unit.

Findings further suggest that, despite fewer patients being assessed, the intervention may have increased the chance of patients receiving appropriate delirium management. The number of patients identified as CAM-ICU positive was greater in audit two. This means more patients received treatment for delirium. It is difficult to say, however, whether this was due to better screening.

We did not consider the issue of covert resistance (CR). Covert resistance can be defined as a concealed effort to resist change (Lorenzi et al. 2000). This type of resistance can be present during all types of organisational change and should be considered as a normal part of the change process. Lorenzi et al. (2000) note that this may be overcome by ensuring staff feel involved and engaged in any changes which are taking place. Failing to take the issue of CR into account may have been a threat to the project.

**Spreading changes**

It is clear that further analysis and reflection are necessary to identify barriers to successful implementation of delirium assessment. Sustaining and embedding change is a key component of quality improvement (HQIP 2015). Change can take years to become embedded in practice. In contrast to us, Musolf *et al.* (2016) audited practice after twelve rather than five months, further illustrating that a change in practice requires time to become embedded. We plan to introduce monthly audits to assess ongoing compliance. In addition, we plan to address the barriers to implementation, which we have identified.

Multi-disciplinary team working is key to our future success. To improve future staff engagement, we have provided staff comment boxes to allow opportunity to feedback to the delirium group anonymously. Each staff group will also have an opportunity to provide feedback at our monthly meetings which are open for all staff. We further anticipate that the introduction of a computerised system will mean that these assessment tools will be available to all members of MDT.

Ongoing training and awareness sessions are vital to sustaining change over time. There are a large number of nurses, doctors and other health professionals across three units, and our initial one week education drive proved insufficient to reach a large proportion of the workforce. Ongoing mandatory training on delirium assessment and identification is therefore necessary. A long term goal is to train all staff including nurses, medical staff, pharmacists, therapists. Brummel et al. (2013) suggest a multifaceted approach to education. Based on this, we plan to deliver more specific and targeted training and case based studies to those in each of the ICUs and are currently working with members of the multidisciplinary team to develop specific case studies suitable for all disciplines.

**Evaluating the success of the QI approach**

The Model for Improvement (IHI 2018) offered a useful and easy to follow framework for us to address our project aim. As suggested by van de Boogaard et al. (2009), a QI model, which better considers potential barriers before implementation may, however, have improved our outcomes. For example, Riekerk et al. (2009) reported use of a more phased implementation process where potential barriers were addressed first and all interventions subsequently evaluated. Although carried out in a smaller unit, Riekerk et al. (2009) demonstrated a large increase in compliance with their use of delirium assessment tools using this model. Furthermore a QI model which acknowledges the complexity of contemporary critical care may have increased the chances of sustaining changes in practice.

A key element of any QI model is stakeholder engagement. Devlin et al. (2007) further note the importance of engaging senior staff who can provide leadership and who can help embed the ways of working into organisational practice. This was a strength of our project, with robust engagement from the wider multidisciplinary team (MDT).

A major component of many QI projects, including ours, is education. Despite making this a priority, our findings suggest the identification, diagnosis and treatment of delirium was still not well understood amongst the critical care staff. Our education programme focused on the traditional approach to changing professional behaviour, which focuses on the individual professional (Johnson et al. 2015). In a systematic review by Brummel et al. (2013) it was noted, however, that attention to the context of care and its culture is necessary for successful change.

**Limitations**

Our results may have been skewed by a change in the way data were collected between the two audits. On reflection the group realised that by asking staff if delirium assessment was performed that we were actually prompting them and this may have skewed our results from audit one.

We also failed to take into account patient acuity when collecting our data. The level of acuity on each unit could have potentially skewed the number of CAM-ICU positive patients. Furthermore the delirium assessment tool was not available to all members of the multidisciplinary team in the first stages of the project.

Whilst the model for improvement was useful as a guide in practice, we did not follow the model rigidly and went through only one PDSA cycle. This may further account for some of our results.

**Conclusion**

This QI project successfully implemented delirium screening into a critical care unit using the model for improvement. Although the need for ongoing education, audit and feedback are important to sustain, embed and spread this practice, our data support compliance rates similar to other settings. For future practice, we recommend the use of a QI method better focused on addressing potential barriers prior to project implementation. Ongoing regular compliance monitoring is also required and should be shared with the whole critical care team.

**What is known about this topic:**

Delirium assessment improves outcomes for critically ill patients. It is possible to successfully introduce delirium assessment into a critical care unit.

**What this paper adds:**

* Evidence that the model for improvement can be used to implement delirium assessment in a large ICU setting.
* A reflection based on experience of the importance of assessing potential barriers to change at the outset of a project and acknowledging the complexity of the critical care environment.
* A discussion of the importance of ongoing education, audit and feedback required to embed and sustain change in an ICU setting.