BJA

SPECIAL ISSUE

The Vortex: a universal 'high-acuity implementation tool' for emergency airway management

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Abstract

Factors influencing performance during emergency airway management can be broadly divided into issues with preparation and those with implementation. Effective design of resources that provide guidance on management requires consideration of the context in which they are to be used. Many of the major airway guidelines do not specify whether they are intended to be used during preparation or implementation and may not take the context for use into account in their design. This can produce tools which may be not only ineffective but actively disruptive to team function in an emergency. The Vortex is a novel, simple, and predominantly visually based cognitive aid, which has been specifically designed to be used in real time during airway emergencies to support team function and target recognized failings in airway crisis management. Unlike the major algorithms, which are context specific, the Vortex is flexible enough for the same tool to be applied to any circumstance in which airway management takes place, independent of context, patient type, or the intended airway device. This makes the same tool suitable for use by emergency physicians, intensivists, paramedical staff, and anaesthetists. The Vortex contains many of the recognized features of an ideal cognitive tool and may be effective in reducing implementation errors in emergency airway management. Experimental evidence is required to establish this.

Key words: airway management; crew resource management, healthcare; emergencies; emergency treatment; human engineering; medical errors; patient safety

Factors influencing performance during emergency management can be broadly divided into those relating to preparation and those relating to implementation (Fig. 1). Clinician preparation includes all aspects of training, experience, consultation, and planning. Even appropriately prepared clinicians, however, can make basic errors during emergency airway management.[1–3] Rather than reflecting a lack of skill or knowledge required to manage a situation, these errors often involve clinicians becoming cognitively overloaded in situations of stress.[1–8] This compromises their ability both to evaluate the situation and to recall available rescue strategies. Impaired decision-making, fixation, omission, or failure to act are recognized consequences.[1–6 9] Such errors are often compounded by an inability of clinical teams to function effectively.[1 3 4] Psychological barriers to abandoning the various upper airway techniques in favour of invasive techniques,

such as emergency cricothyroidotomy, may further reduce performance.[10 11] Rather than necessarily involving failure to prepare, these issues represent a problem with implementation of the airway plan, although preparation and implementation issues may often coexist within the same clinical situation.[10]

Tools providing guidance on appropriate management can be used during either the preparatory or implementation phases to assist with performance of a task.[4] The taxonomy outlined in Fig. 2 has been coined for this article to improve clarity when discussing these tools. Guidelines, protocols, and procedures can be considered 'foundation tools', which help to explain the task (and the underlying theory) before the event to promote understanding or memory. In contrast, the term 'cognitive aid' specifically refers to 'implementation tools', intended to prompt the user during performance of the task.[2 4 6 7]
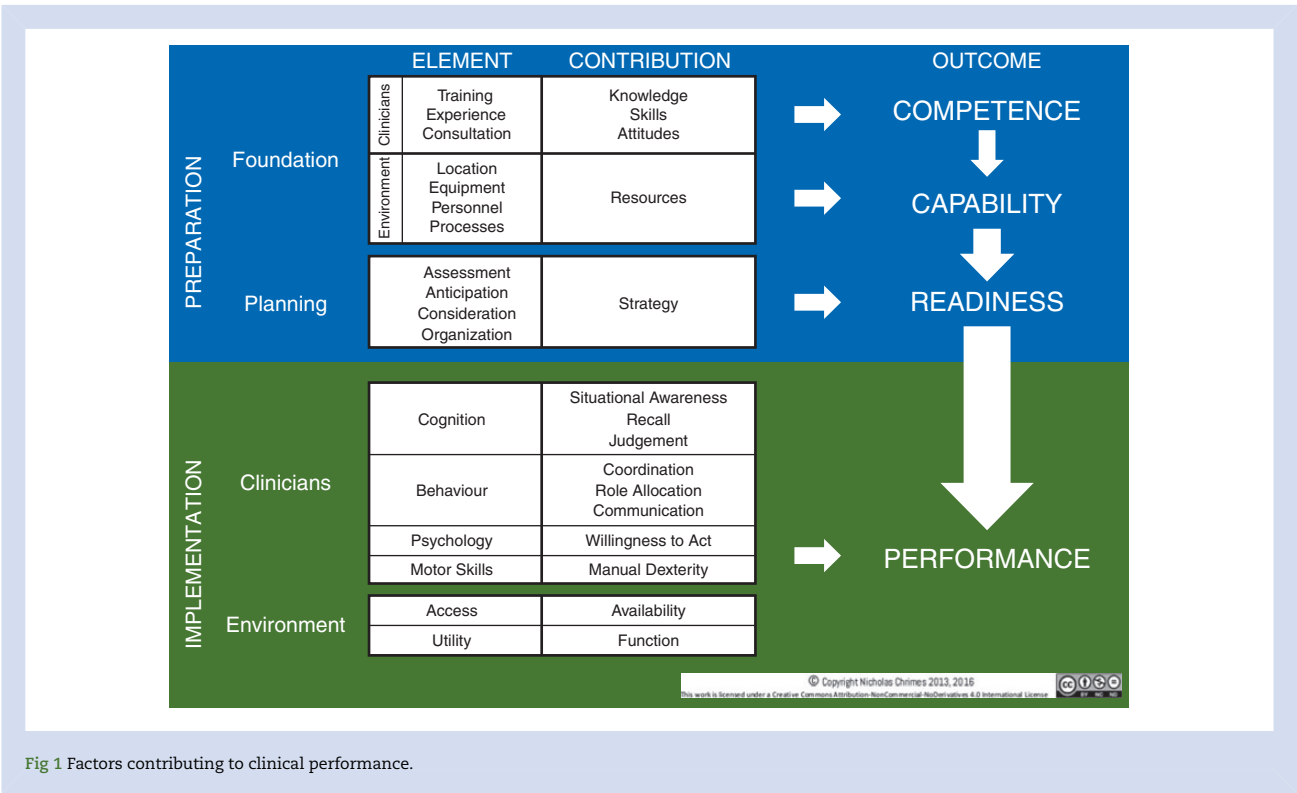
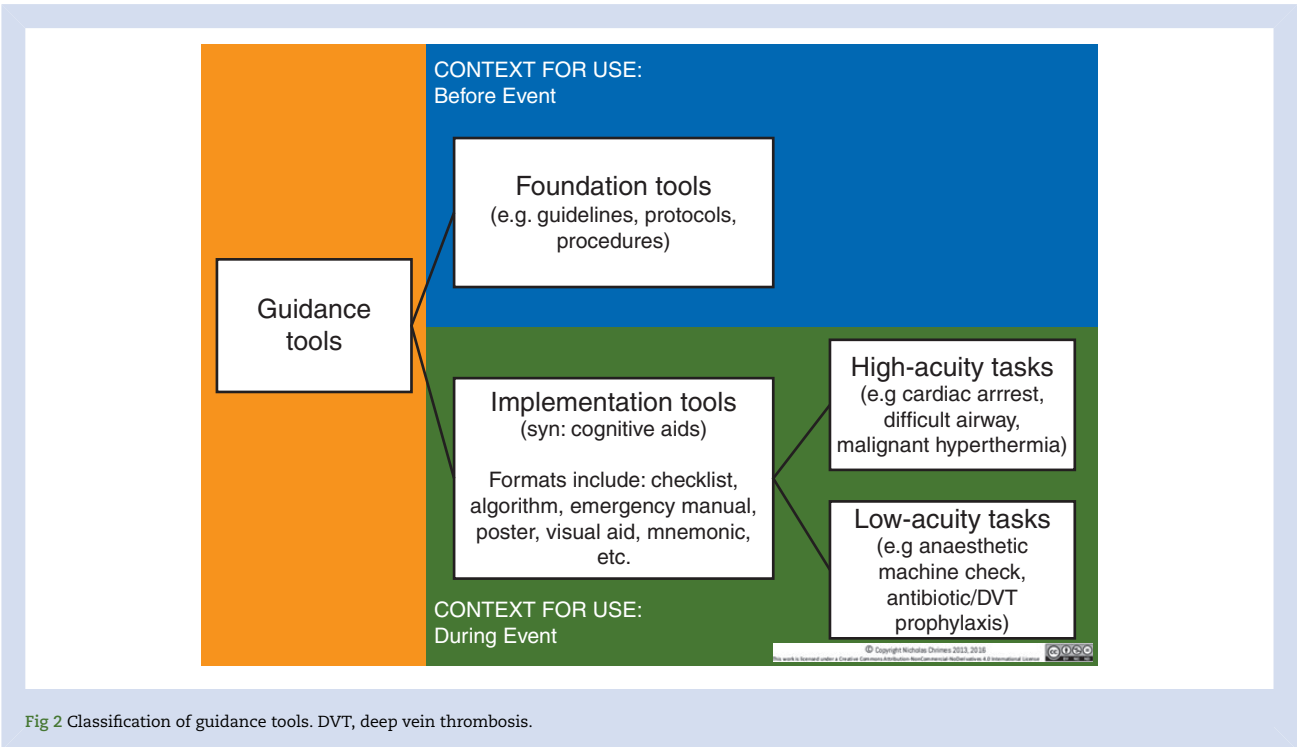**Fig 1** Factors contributing to clinical performance.

Fig 2 Classification of guidance tools. DVT, deep vein thrombosis.

The effectiveness of guidance tools is dependent upon both their technical content and how that content is presented. The design requirements of guidance tools differ significantly depending on the context in which they are to be used.[4][6][7]

Well-constructed implementation tools have the potential to facilitate team situational awareness, improve communication, prompt decision-making, and guide key actions.[2][6][12][13] If poorly designed, however, implementation tools also have the potential