CASSANDRA: A decision support tool for **c**linical **ass**essment **and r**easoning in **a**nesthesia

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STUDY OBJECTIVE

A general task of anesthesiologists is to induce and maintain general anesthesia into a patient. This task includes to rapidly, safely, and pleasantly produce and maintain amnesia, analgesia, akinesia, and an automatic and sensory block while maintaining hemodynamic stability and sufficient ventilation (King & Weaving, 2017). Oftentimes, the anesthesiologists' task is described by the term "hours of boredom and seconds of terror" (Gaba, Fish, Howard, & Rall, 1998). Especially in the "seconds of terror", the operating room (OR) crises, anesthesiologists are required to make decision regardless of whether all information is present and knowing that inadequate decisions may have fatal consequences (Stiegler & Ruskin, 2012).

Therefore, a range of analogue and digital support tools have been developed that aim at influencing the decision-making (Berner & La Lande, 2007). While previous support tools such as checklists have been developed to support the treatment of specific (but rare) diagnoses such as Malignant Hyperthemia (Runciman et al., 2005), support on how to decide on a specific diagnosis in the "seconds of terror" is infrequently addressed. In addition, many support tools in anesthesia as well as in other clinical contexts have failed when being implemented in the actual clinical context (e.g., Elwyn et al., 2013; Jaspers, Smeulers, Vermeulen, & Peute, 2011; Kawamoto, Houlihan, Balas, & Lobach, 2005). Research suggests that the minimal consideration of the actual clinical context during design and evaluation is a potential cause (Musen, Middleton, & Greenes, 2014; Wears & Berg, 2005). A review of the current human-computer-interaction (HCI) literature on support tools for the clinical context supports this issue: The contextual fit of decision support tools (DSTs) has rarely been addressed and the few examples give insights on an exploratory basis without answering why a specific design improved or worsened the contextual fit (e.g. (Yang, Steinfeld, & Zimmerman, 2019; Yang, Zimmerman, Steinfeld, Carey, & Antaki, 2016)). We identified theories of embodied contextual fits (Dourish, 2004; Grundgeiger, Hurtienne, & Happel, 2020; Van Dijk & Hummels, 2017) and needs-based (Grundgeiger et al., 2020; Hassenzahl, Diefenbach, & Göritz, 2010) user experience (UX) to potentially explain the phenomena of (successful and unsuccessful) contextual fits.

Given the lack of proper support tools for the diagnostic process and treatment in the "seconds of terror" and the rarely considered context, our objective was (1) to understand the complex, safety-critical context of OR crises based on UX theories, (2) to develop a decision support tool (called Cassandra) for diagnosis and treatment guided by UX theories, and (3) to evaluate the developed solution and the theoretical framing in a simulator- based study. To do so, we followed a user-centered design process that addressed all ergonomics core competencies.