Decision Making for Patient Safety in Critical Care Equipment Selection

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Injuries resulting from medical device use errors far exceed injuries arising from device failures. Until recently, human factors issues have received relatively little attention in medicine. Although the situation is gradually changing, many devices that are currently on the market are sub-optimal from the human factors perspective. This situation places significant responsibility for the device interface quality on the purchasers. Research on the influence of usability considerations on device purchasers' decision making could provide valuable theoretical foundation for designing medical device selection guidelines.

Medical device selection is a complex team decision making process that involves individuals with varying levels of specialized knowledge, and may reflect a number of individual and group biases. Klein and colleagues describe several aspects of team cognition and metacognition that distinguish successful teams (for review, see Klein, 1998). They suggest that successful teams are characterized by experience, stability and coherence. Members of such teams have common goals and share understanding of the situation. They use their "collective intelligence" to monitor their performance. In medicine, success of team functioning is related to similar decision-making characteristics (Patel, et al. 2002). This paper describes a retrospective analysis of an infusion pumps purchase in a large urban hospital system and focuses on cognitive and organizational factors in the decision making process. The study involved a) semi-structured interviews with nine participants in the latest infusion pumps purchase in a major urban hospital system, and b) analysis of documents relevant to the purchase. The data analysis was based on several formal qualitative analytic methods, including thematic coding and semantic analysis.

Results and Discussion

The process of infusion pumps selection involved three stages: selecting two candidates for the clinical evaluation, clinical evaluation and post-evaluation deliberations. Although the process involved individuals with three types of expertise (administrative, engineering and clinical), it was largely driven by the administrative framework. In the crucial decision-making stages, selection of candidates and post-evaluation deliberation, the input from the two participating clinical groups (one comprised of high-ranking physicians and the other of nurse managers) was limited. Restricted flow among the participating groups prevented interactions between 1) the two clinical committees and 2) the administrators and the actual users of the infusion pumps. This precluded the participants from developing shared model of the process and created potential for distortion and loss of critical information.

The process of decision making was hypothesis-driven, rather than data driven. It started with considering a new model of a vendor that was already present in the hospital. Even after significant problems were found with the model, much effort was invested in establishing clinical acceptability of that pump (which was less expensive than the its competitor). On the basis of the user satisfaction survey, core group administrators concluded that the initial candidate was equal in quality and superior in cost to the other candidate. Analysis of the survey suggested that its questions reflect few established usability design principles.

The study also showed marked differences among administrators' and clinicians' views on patient safety. While clinicians had a broad view of safety that included usability considerations, administrators' model of device safety was largely technical, in which device safety was viewed in terms if its durability and accuracy. These two views do not interact and thus the decision-making process is exclusively driven by forces that are common to both, namely financial forces, with little awareness of it by the participants.

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References

Klein, G.A. (1998). Sources of power: How people make decisions. Cambridge, Mass: MIT Press.

Patel, V.L., Kaufman, D.R. & Arocha, J. F. (2002). Emerging paradigms of cognition in medical decision making. *Journal of Biomedical Informatics, 35(1),* 52-75.