建置行爲辨識系統於非計劃性拔管預防之研究

The Study of Building a Behavior Identification System to Prevent Unplanned Extubation

中文摘要

醫學科技進步的同時，病人安全也開始被重視，然而「安全」的第一步，就是要「免於意外傷害」(Institute of Medicine，2000)。非計畫性氣管內管滑脫常見於急重症加護單位，當發生氣管內管滑脫時，會導致呼吸器使用時間延長、住院天數增加、心律失常、血流動力學不穩定、甚至危急病人生命等嚴重之合併症。非計畫性氣管內管滑脫率也是一項評估醫療品質的工具，因此如何預防非計畫性氣管內管滑脫是醫療院所面臨的一項重要且棘手的問題。

經分析發現，非計畫性氣管內管滑脫成因中，以自行拔除氣管內管的型態佔最多。然而現有的預防措施，如加強護理人員訓練；護理人員加強照護、溝通；約束相關措施；使用鎮靜劑等措施，未有顯著預防之成效。本研究即以建置一預防自拔氣管內管之行爲辨識系統爲主題，評估各種辨識系統開發之可行性，目的是經由決策分析選擇最適當的行爲辨識系統，作爲未來進行產品設計研發之參考，以增加成功機率與避免不必要的資源浪費。藉由研究之結果，作爲未來研發者建置拔管行爲辨識系統的建議方案，期成功建置並運用於臨床病人的自拔管預防，當病人有自拔氣管內管行爲時，此行爲辨識系統能偵測且正確判斷出病人的拔管行爲，並立即通知醫護人員已有效阻止病人拔管，進而維護病人安全。

本研究採德菲爾法(Delphi method)，以專家問卷建立出「建置拔管行爲辨識系統」的決策因素，分別爲「感測設備技術成熟度」、「行爲辨識系統易開發」、「行爲辨識系統準確性」、「臨床照護監測設備適用性」、「臨床照護監測設備安全性」、「建置成本低」等六項；另外彙整有 RFID 辨識系統、加速度計辨識系統、紅外線感應辨識系統、磁式感應辨識系統、訊息手套辨識系統等五項替代方案。透過層級分析法(Analytic Hierarchy Process ,AHP)由專家進行相對重要性之比較，將調查之問卷經由軟體 Expert Choice 11.5 版本分析出各層級重要性權重，分析結果中在替代方案是以加速度計辨識系統爲首選，其次依序爲訊息手套辨識系統、RFID 辨識系統、紅外線感應辨識系統及磁式感應辨識系統。

本研究乃經由資訊、醫療設備及臨床醫療專家的經驗，綜合得出之結果以建置拔管行爲辨識系以加速度辨識系統作爲研發建置之優先決策方案，以此作爲未來醫療資訊設備研發人員後續努力的方向，期未來採納本研究建議並運用於實際研發建置，進而應用於臨床病人，以期真正預防其拔管行爲，並達到病人安全。

英文摘要

At the same time the medical technology has developed rapidly, the patient safety has also made much attention gradually. The first step of「safety」is「freedom from

accidental injury」(Institute of Medicine, 2000). A number of unplanned extubation taken place in critical care unit. When an accidental extubation occurred, it often caused the extended usage of mechanical ventilator、prolong the length of hospital stay、arrhythmia、hemodynamically unstable and even triggered serious complications to patients. Unplanned extubation ratio is an indicator of healthcare quality in ICU, how to prevent and reduce the unplanned endotracheal extubation becomes one of the most critical issues for hospitals.
From many studies, we found the major type of caused factors for unplanned endotracheal extubation come from the self-extubation, i.e. the patient removes the endotracheal tube himself. However, among the preventive measures such as staff education、increasing safety during nursing interventions、communications、use of restraints in patient''s and sedation protocols and so on, most of them have been practiced in hospitals but it seemed that the outcome is yet satisfactory after all. Our subject of this research is to evaluate the feasibility of developing a behavior identification system among various possibilities. The goal of our study is to help professionals to build up a preventive self-extubation behavior identification system to meet the needs of care. Therefore, to increase the success rate and apply resources more effectively, we chose in this study the most appropriate behavior identification systems from various decision making analysis that act as the research reference for the base of future product development. We hope the developers can take the outcome of this study as their solution proposal while their building the extubation behavior identification system, and to monitor correctly at bedside and raise alert signals to healthcare givers to avoid extubation from patients themselves and eventually, to improve the patient safety among others.
In this study, we use the Delphi method and design expert questionnaire of 「Building the Extubation Behavior Identification System」for the decision-making factors where includes: 「maturity of technology of sensing equipment」、「facilitation of development for behavior identification system」、「accuracy of behavior identification system」、「feasibility of monitoring equipment for clinical care」、「safety of bedside monitoring equipment」 and 「cost of implementation」. Also, we have analyzed systems such as RFID system、accelerometer identification system、infrared ray sensing identification system、magnetic sensing identification system and digital glove identification system to be the alternatives. With the Analytic Hierarchy Process (AHP), the experts compared and weighted the relatively importance among different levels by using Expert Choice v.11.5. The result of this analysis for alternative system in the order of priority is : accelerometer identification system、digital glove identification system、RFID system、infrared ray sensing identification system and magnetic sensing identification system.

The result of this study were acquired by the experiences from the experts of Informatics、Medical Equipment and Clinical Care, that has concluded the accelerometer identification system is the first priority of choice for developers when they consider to build up the Extubation Behavior Identification System to improve the patient safety in the near future.