eEvidence: Information Seeking Support for Evidence-based Practice: An Implementation Case Study

Jin Zhao, Min-Yen Kan, Paula M. Procter, Siti Zubaidah, Wai Kin Yip, Goh Mien Li
Evidence-based Practice (EBP)

- Advantages
  - Reliable
  - Efficient
  - Updated
Two Stages of EBP

- **Stage 1: Search and Appraise**
  - Crucial yet difficult!
  - EBP Resources → Research Articles → Interventions

- **Stage 2: Apply and Evaluate**
  - Interventions → Evaluation → Interventions
Problems in the Search & Appraise Stage

- Accessibility issues
  - Collection-specific specialized search engines
  - Subscription barrier
Problems in the Search & Appraise Stage

- Usability gap in search engines
  - Key information not displayed or usable in searching

Effects of Intermittent Electrical Stimulation on Superficial Pressure, Tissue Oxygenation, and Discomfort Levels for the Prevention of Deep Tissue Injury.

Rehabilitation Science Program, Faculty of Rehabilitation Medicine, University of Alberta, Edmonton, AB, Canada.

Abstract
The overall goal of this project is to develop effective methods for the prevention of deep tissue injury (DTI). DTI is a severe type of pressure ulcer that originates at deep bone-muscle interfaces as a result of the prolonged compression of tissue. It affects individuals with reduced mobility and sensation, particularly those with spinal cord injury. We previously proposed using a novel electrical stimulation paradigm called intermittent electrical stimulation (IES) for the prophylactic prevention of DTI. IES-induced contractions mimic the natural repositioning performed by intact individuals, who subconsciously reposition themselves as a result of discomfort due to prolonged sitting. In this study, we investigated the effectiveness of various IES paradigms in reducing pressure around the ischial tuberosities, increasing tissue oxygenation throughout the gluteal muscles, and reducing sitting discomfort in able-bodied volunteers. The results were compared to the effects of voluntary muscle contractions and conventional pressure relief maneuvers (wheelchair push-ups). IES significantly reduced pressure around the tuberosities, produced significant and long-lasting elevations in tissue oxygenation, and significantly reduced discomfort produced by prolonged sitting. IES performed as well or better than both voluntary contractions and chair push-ups. The results suggest that IES may be an effective means for the prevention of DTI.
Problems in the Search & Appraise Stage

- Different search patterns
  - Active search
    - Search engine
  - Passive search
    - Decision-support system

PubMed Advanced Search

- Clinical trial protocol
- UMLS definition
- Overview of search results
- Standards of Practice
eEvidence System for EBP

- **Key features**
  - Harvesting EBP resources by periodic crawling
    - Ensures up-to-date coverage
  - Automated article classification and key information extraction
    - Provides crucial information to assist search and appraisal
  - Dual active/passive user interface
    - Caters for different search patterns
System Architecture
Harvesting EBP Resources by Periodic Crawling

- **Two stages**
  - Selection of EBP resources by experts
  - Periodic crawling using Nutch

- **Advantages**
  - Able to harvest from any type of EBP resources
  - Always up-to-date
Automated Article Classification and Key Information Extraction

• **Supervised machine learning pipeline**
  – Three categories: abstract / full text / others
  – Maximum entropy classifier
  – Text, webpage and formatting features

• **Advantages**
  – Filters out useless webpages
  – Allows users to zoom to subsets of articles
Automated Article Classification and Key Information Extraction

• Year of publication, time added, URL

  □ Impact of Invasive and Noninvasive Quantitative Culture Sampling on Outcome of Ventilator-Associated Pneumonia: A Pilot Study -- SANCHEZ-NIETO et al. 157 (2): 371 -- American Journal of Respiratory and Critical Care Medicine
  Year of Publication: 1998
  Full text, Added: 2 days ago
  ...not given for pneumonia. In all cases... specifically given for pneumonia. Twenty (83%) patients belonged to... of late-onset (7 d) pneumonia. Late-onset pneumonia was considered in 14... directly attributable to pneumonia. This occurred in three... mechanically ventilated patients with nosocomial pneumonia. In addition, quantitative... mortality of ventilator-associated pneumonia (VAP) ranges from 21 to... a poor outcome from nosocomial...
  http://archinn.ajrccm.com/content/full/157/2/371

• Key sentences / keywords

  We performed an open, prospective, randomized clinical trial in 51 patients receiving mechanical ventilation for more than 72 h, in order to evaluate the impact of using noninvasive (quantitative endotracheal aspirates [QEA]) diagnostic method on the morbidity and mortality of ventilator-associated pneumonia (VAP).

• Advantages
  – Provides crucial information to assist search and appraisal
Dual Interface (Read)

• Recommend relevant articles based on user profile

We performed an open, prospective, randomized clinical trial in 51 patients receiving mechanical ventilation for more than 72 h, in order to evaluate the impact of using noninvasive quantitative endotracheal aspirates (QEA) diagnostic method on the morbidity and mortality of ventilator-associated pneumonia (VAP).
Dual Interface (Search)

- **Allow users to search with complex query and filters**

  ![Search Interface](image)

  - **Enter your query here:**
    - Primary keyword 1, Primary keyword 2 ... [Secondary Keyword 1, Secondary Keyword 2 ...]
  
  - **Sort by:**
    - Relevance, Time Added, Year of Publication
  
  - **Additional Clauses:**
    - Connected using AND
      - pressure ulcer [treatment]
      - pressure sore [diagnosis]

- **Search history in place of profile**

  ![Search History](image)

  **Search History:**
  - pressure ulcer [treatment]
  
  **(12), 18-08-2010**

  >> Click to see detailed history
Discussion

• Iterative development methodology
  – Interview users for requirements
  – Design and implement features
  – Gather user feedbacks of the system

• Current feedbacks
  – Able to focus on full text articles and the latest additions
  – Able to find freely available full text articles
  – Search history useful for writing of search methodology

• Future work
  – Extend collection and perform full-fledged evaluation
Conclusion

- **eEvidence**: an information seeking support system with three key features to facilitate EBP
  - Harvesting EBP resources by periodic crawling
  - Automated article classification and key information extraction
  - Dual active/passive user interface