Continual Development of a Personalized Decision Support System

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Background

Collaboration between:
National Institutes of Health (NIH)
- Nursing and Patient Care Services
- Dept. of Clinical Research Informatics
National Library of Medicine (NLM)
Purpose

• Provide access to key facts needed to support clinical decision making and evidence based plans of care

Approach

• Design and build a system which enables a medical institution to automatically augment a patient’s Electronic Medical Record (EMR) with pertinent patient-specific information from NLM's and other evidence-based resources
InfoBot Architecture and Processes

NIH Clinical Center

1. Click InfoBot tab
2. Get stored procedures for retrieval of predefined CRIS fields
3. Send HTTP request to InfoBot

CRIS Database

4. Show InfoBot dashboard

NLM EBP InfoBot

5. Get information
6. Fill out the dashboard template
7. Send response

1. Find problems, interventions, anatomic locations in text
2. Split medication lists, find names
3. Look-up rules for specific problems, compose searches
4. Get information
Continuous evaluation

• Prototype evaluation
• Focus Group
  – Barriers
  – Enhancers
• Access and Usage Data
  – 6 months & ongoing post implementation
• Online Survey Questionnaire
  – User Satisfaction
  – Ease of Navigation
Prototype evaluation

Patient Data from CRIS

Chief Complaint: chronic granulomatous disease
Protocol: Clinical Trial Protocol
Problem: increased pain with lying on table for radiation simulation despite receiving pre-meds.
... (more information)

Key Search Terms and Definitions

Chief Complaint: chronic granulomatous disease
Problem: increased pain with lying on table for radiation simulation despite receiving pre-meds.
Problem: X-linked defect of leucocyte function in which phagocytic cells ingest but fail to digest bacteria, resulting in recurring bacterial infections with grandona formation.
Problem: sacral area, right butt check dehiscence ulcer

InfoBot Results

Related Articles

Entral nutritional support in prevention and treatment of pressure ulcers: a systematic review and meta-analysis.
Problems: pressure ulcers
Interventions: nutritional support
Population: 0
Outcomes: RESULTS: Meta-analysis showed that ONS (250-500 kcal, 2-6 weeks) were associated with a significantly lower incidence of pressure ulcer development in at-risk patients compared to routine care. CONCLUSIONS: This systematic review shows enteral nutritional support, particularly high protein ONS, can significantly reduce the risk of developing pressure ulcers (by 29%).

Evaluating the implementation and outcomes of the Saskatchewan Pressure Ulcer Guidelines in long-term care facilities.
Evaluation Questions

• To what extent is the InfoBot output relevant to the patient cases presented?

• To what extent is the InfoBot output useful in clinical care?

• How easy is the InfoBot system to use?

• How often would the InfoBot system be used?
Conclusions

• InfoBot system is easy to use

• 75% respondents would use it at least once a week

• 56.2% respondents indicated a need for more information

• Overall all document types were found to be relevant and useful in the majority of cases
Recommendations

• Continue development of InfoBot system to address evaluator’s feedback (both resources and functions)
• Improve MEDLINE retrieval quality
• Develop the InfoBot 2.0 interface
• Integrate local resources
• Evaluate the interface using focus groups
• Expand user base
• Integrate with CRIS
Project Needs

• Staffing:
  – Continued project leader commitment from NLM, DCRI, & NPCS
  – Clinical staff to provide feedback

• Resources:
  – More information about investigational drugs and procedures, protocols
  – Unit guidelines, standards of care
  – Care plan text book, Mosby's Nursing materials
  – Micromedex
  – More patient education materials
  – FDA recalls, market withdrawals and safety alerts
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### Access and Usage

- 1545 unique users (six months)
- 861 returning users
- Between 2 and 4 hits an hour covering all hours

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Barriers to using InfoBot

• **Time Constraints**
  – Search articles but no time to read them
  – Short time span to capture relevant information
  – Time to do reading not incorporated into the day

• **Limited Training**
  – Not reaching nurses that do not attend NPC or CPC meetings
  – Reading an abstract or interpreting the research

• **Relatedness to patient**
  – Managing chief complaint
  – Pertinent diagnosis information
  – Patients who are on multiple protocols
Focus Groups

• Enhancers
  – Access to medication information
  – Easy to use and quick retrieval
  – Information condensed in one location

• Recommendations
  – Incorporate EBP InfoBot training into CRIS orientation
  – Develop drop down lists to enter problems
  – Create fact sheets
  – Allow time for Nursing Rounds to review articles
  – Picture of pills
  – Sample discharge planning
InfoBot dashboard III

Medications:
- acetaminophen
- camphor-menthol topical
- clindamycin
- cyclosporin
- diphenhydramine

Pill Box images:
- clindamycin
- ondansetron
- pantoprazole

MedlinePlus
SEVERE APLASTIC ANEMIA

[Unrelated HLA-mismatched cord blood transplantation for adult patient with very severe aplastic anemia]. Rinsho Ketsueki 2006

Outcome of adult severe or very severe aplastic anemia treated with immunosuppressive therapy compared with bone marrow transplantation: multicenter trial. Int J Hematol 2003

Patient age, sex, initial platelet count, etiology, or treatment regimen did not significantly affect survival. Cox regression analysis showed low ANC to be the only pretreatment variable significantly associated with poor survival (P = .000). These results suggest that ISA can achieve a high response rate and long-term survival among patients with adult AA, regardless of disease severity.

Fludarabine, cyclophosphamide, anti-thymocyteglobulin, and low-dose total body irradiation conditioning enables 1-HLA-locus-mismatched hematopoietic stem cell transplantation for very severe aplastic anemia without affecting ovarian function. Am J Hematol 2009

First-line matched related donor hematopoietic stem cell transplantation compared to immunosuppressive therapy in acquired severe aplastic anemia. PLoS One 2011
Challenges

• Technical trade-offs
  – Real time processing vs. quality
    • NLP parsers are slow
    • Best evidence searches are iterative

• Continuous collaboration
  – EHR format and storage change
    • Need notifications
    • Time for system update

• Users’ time
  – Self-education not included in the workflow
Nursing Implications

- EBP InfoBot provides free-text real time processing support
- Evidence to support planning care at the point of care
- Reduces information overload
- Easy to use and navigate
Questions?