



# Rational Design of a Computer-Based Decision Support System for Primary Care Settings

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# Objective

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- To design computer-based decision support system (CDSS) for prescribing in primary care settings
- Design is based on focused analysis of baseline prescribing data.



# Setting

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- The **C.O.M.P.E.T.E.** Study (Computerization of Medical Practices for the Enhancement of Therapeutic Effectiveness)
  - Based in a primary care setting in Southern Ontario, Canada
  - Evaluating impact of EMR implementation and computerized decision support on work environment, quality of care and concerns re: privacy



## Setting contd.

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- 32 family physicians in 18 primary care clinics, were recruited, fitted, installed, trained and supported in the use of a structured data EMR [*Purkinje Inc.'s Dossier of Clinical Information (DCI)*]
  - Physicians were trained and supported to chart in real-time
- Physicians chart an average of 76% of their patient information into the EMR (min-max 0-100%).



# Setting contd.

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- **Data quality still an issue**
  - Structured database EMR but:
    - Variability inter and intra-physicians in EMR charting completeness
    - Discrepancies between administrative and EMR data
    - Look-up tables not always used, some data entered as text
    - Sections of chart (consults, some diagnostics) not electronic



# Method (Lit Search)

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- Systematic review
  - Few Level 1 trials (RCT, intervention described in sufficient detail)
  - Include only general mention of technical and usability factors
  - Trials and systematic reviews demonstrate variable efficacy of CDSS
  - NO high quality trial evaluating factors correlated with success versus failure of CDSS



# Methods (Data)

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- Data anonymized, extracted then collected using Remote Access System (RAS) by modem dial-in
- A Clinical Research database developed to organize extracted EMR data into linked tables for analysis
- Concurrent systematic review of literature for factors predicting success of CDSS



# Methods (Outcome Measure)

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- APEQ (Appropriateness of Prescribing Evaluation Questionnaire) is an explicit, validated tool for measuring appropriate-ness of prescribing in 10 different domains
- Based on these domains, we used our EMR Research database to test for deficits in baseline prescribing.
- Deficits discovered then influenced directly the CDSS design



# Hypotheses

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- Four main types of *potential* prescribing problems were identified\*
  - Lack of documentation about prior therapies used, particularly OTC and non-pharmacologic therapies
  - Details of prescription itself incomplete (e.g., dose, duration, monitoring)
  - Oversight of contra-indications for a medication (drug-disease or drug-drug interaction)
  - Use of expensive or second-line therapy

\* **NOTE:** Based on musculoskeletal diseases prescribing. Assumes diagnosis is correct and Level 1 evidence supports drug efficacy



# Results

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- Documentation of Prior Therapies
  - 4490 patients have MSK diagnosis
    - 2300 were prescribed an NSAID
    - Only 175 have acetaminophen documented as a prior therapy
- Prescription in spite of risk
  - Most drug-drug interactions are screened by the EMR software, prevalence is difficult to estimate
  - Potential drug-disease interactions existed in about 3% of patients (NSAID + PUD)
  - Potential age-related toxicity was found in about 2% of patients (NSAID + Age > 75)
    - As many as 5% of patients may be placed at undue risk



# Results contd.

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- Completeness of prescription

**For every 100 prescriptions, other information specified:**

- |                            |                      |
|----------------------------|----------------------|
| ■ Dosage form              | ■ 99% coded, 1% text |
| ■ No. of tablets per dose  | ■ 90%                |
| ■ Route of administration  | ■ 39%                |
| ■ Frequency of ingestion   | ■ 88%                |
| ■ Quantity dispensed       | ■ 65%                |
| ■ Duration of prescription | ■ 36%                |



# Results contd.

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- Prescribing expensive or second-line therapy
  - This analysis was much more difficult to conduct
    - Requires a check as to whether a less expensive medication/first-line therapy was prescribed but was found to be inefficacious or not tolerated
  - Currently in the process of analyzing the proportion of inexpensive:expensive and first-line:second-line therapies being used



# Implications for CDSS Design

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- Lack of documentation
  - Provide templates or other method for physicians to quickly note prior therapies and prior experience
- Incomplete documentation
  - Use on-screen validation of critical information to ensure complete information
- Oversight of patient-pertinent information
  - Use reminders/alerts to inform user of relevant info
- Oversight of non-patient-specific information
  - Provide relevant decision-making data (e.g., cost, evidence, pre-test probabilities) at the point of decision-making



# Discussion

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- The literature suggests that successful CDSS need to use multiple interventions
  - No clear guidance in literature on characteristics of successful CDSS, thus this is a priority area for research
- COMPETE will test impact of CDSS based on analysis of specific prescribing deficits of subject physicians