REMINDER-BASED OR ON-DEMAND DECISION SUPPORT SYSTEMS: A PRELIMINARY STUDY IN PRIMARY CARE WITH THE MANAGEMENT OF HYPERTENSION

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ONE SIZE DOES NOT FIT ALL: A PRELIMINARY STUDY IN PRIMARY CARE WITH THE MANAGEMENT OF HYPERTENSION
Computer-based guideline implementation systems

- Considerable effort for the development and dissemination of CPGs
  - low levels of physicians’ compliance with guidelines
- Computer-based DSSs have proved to be effective in improving physicians’ performance
- Systematic reviews give mixed results
  - success is not guaranteed
  - some studies failed to show any effect of reminder-based computer interventions
  - “negative comments about the DSS significantly outweighted the positive or neutral comments” (Rousseau et al. a)

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Are there successful design factors?

- Published studies fail to describe systems in sufficient details
  - success of proactive approaches based on automatically triggered reminders
  - “on-demand” information sources more positively viewed than alerts (Rousseau et al.)
- Working hypothesis
  - one size does not fit all
  - deaveraging guideline implementation models used in DSSs
  - fit physicians’ needs of clinical information
- Design factors are not absolute factors of success
  - proactive approaches based on reminders are successful design factors for supporting the management of simple patient conditions
  - on-demand approaches based on physicians’ initiative to search for information are successful design factors for supporting the management of complex patient conditions
Recommendations for uncomplicated hypertension (1/2)

- Simple patient case \((\text{adult} < 60) \land (\text{uncomplicated}_\text{HT}) \land (\text{no_contraindication})\)

1. Initial therapy should be monotherapy with a thiazide diuretic, preferably at a low dose, a β-adrenergic antagonist or an angiotensin-converting-enzyme (ACE) inhibitor (grade A). If the response is inadequate or there are adverse effects, substitute another drug from the initial drug therapy group (grade D).

2. Combination therapy, either with a thiazide diuretic and a β-adrenergic antagonist or with a thiazide diuretic and an ACE inhibitor, should be used if there is only a partial response to monotherapy (grade A).

3. If blood pressure is still not controlled, or there are adverse effects, try other classes of antihypertensive drugs (calcium-channel blockers, angiotensin II receptor antagonists, alpha-adrenergic antagonists or centrally acting agents) either as monotherapy or in combination (grade D). Consider possible reasons for a poor response to therapy, such as noncompliance, secondary causes of hypertension or interactions between prescribed treatment and diet or other drugs (grade D).

- Straightforward recommendation:

\[
\text{monotherapy} \land ((\text{TD}_\text{low}_\text{dose}) \lor (\beta - \text{adrenergic}_\text{antagonist}) \lor (\text{ACE}_\text{in}))
\]
Recommendations for uncomplicated hypertension (2/2)

- Complex patient case:
  \[(\text{adult} < 60) \land (\text{uncomplicated\_HT}) \land (\text{no\_contraindication}) \land (\text{response\_to\_initial\_therapy\_is\_inadequate}) \land (\text{substitution\_of\_another\_drug\_from\_the\_initial\_drug\_therapy\_group\_is\_inadequate}) \land (\text{combination\_therapy\_with\_thiazide\_diuretic\_and\_\beta\_adrenergic\_antagonist\_is\_inadequate}) \land (\text{combination\_therapy\_with\_thiazide\_diuretic\_and\_ACE\_inhibitor\_is\_inadequate})\]

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Management of simple patient cases

- Physicians’ attitude
  - they think they have no difficulty to establish the right therapy
  - they don’t need decision support
  - they may be wrong when they think they know

- Computer-based decision support should be reminder-based to alert physicians when prescription does not comply with guidelines
  - data needed to characterize simple conditions involve
    - only few data
    - currently available
    - relevant triggering of reminders
  - provide recommendations with the right level of specificity
Management of complex patient cases

- Physicians’ attitude
  - they recognize they have difficulties to establish the recommended therapy
  - they need decision support
  - they look for information including the advice of colleagues or the consultation of online resources

- Computer-based decision support should be “on-demand”
  - complex conditions rely on decisions and actions that lead to dependent changes in patient states over time
  - data needed to characterise the whole picture of a patient state involve a lot of current and previous data
  - formally matching individual patient characteristics to the computerized version of guidelines may lead to inappropriate recommendations
  - documentary paradigm of decision support (proposed with OncoDoc) is an improved version of “on-demand” approaches that may answer the difficulty
ASTI, a mixed guideline-based DSS for therapeutic prescribing in primary care

- **Critic mode**
  - automatically works from the input of a physician’s prescription
  - evaluates the prescription by comparison with guideline recommendations
  - alerts about the recommended therapy if necessary
  - displays the corresponding part of narrative guidelines as explanations

- **Guided mode**
  - starts on the physician’s initiative
  - no initial prescription is necessary
  - hypertextual navigation through the knowledge base (decision tree)
  - dynamic physician-controlled instantiation of patient parameters
  - takes the physician to the best recommended patient-specific therapy
Architecture of the system

Abstracted patient data

Guideline-based derivation rules

Guided mode

Guideline-based decision tree

Drug Database

Guideline-based IF-THEN rules

Patient-based derivation rules

Critic mode

EMR

POE

Patient data

Physician order

ASTI

Guideline-based recommendations

SCGP’04, April 12–14, Prague, Czech Republic
Preliminary evaluation of ASTI

- 15 actual clinical cases
- 10 general practitioners (GPs)
- 2 phases: without and with ASTI (before/after design)
  - without ASTI: prescriptions established from narrative description of clinical cases
  - with ASTI: 3 periods
    - ASTI critic mode (5 clinical cases)
    - ASTI guided mode (5 clinical cases)
    - ASTI free use (5 clinical cases)
- choice of operating modality is always active (physicians control the triggering of both critic and guided modes)
- analysis of the 50 prescriptions established with ASTI free use
Complexity score of clinical cases

- **Clinical complexity**
  - Number of diseases or risk factors associated to hypertension
  - $CC_{\text{(uncomplicated hypertension)}} = 0$, $CC_{\text{(hypertension+diabetes)}} = 1$, etc.

- **Therapeutic complexity**
  - Number of treatments previously administered in terms of therapeutic classes
  - $TC_{\text{(never treated)}} = 0$, $TC_{\text{(ACE inhibitors)}} = 1$, $TC_{\text{(ACE inhibitors,ACE inhibitors+thiazide)}} = 2$, etc.

- **Complexity score**
  - $CS = CC + TC$

- **Qualitative complexity levels**

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### Results

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Results
Conclusions

- Not designed to evaluate the effectiveness of ASTI to change physicians’ behaviour
  - *in-vitro* study
  - non randomized design
  - small numbers of clinical cases and GPs
  - perspectives: to evaluate the impact of ASTI on a large randomized before-after study (hypertension and diabetes)
- Designed to test
  - a single mode of implementing guidelines in DSSs
    - does not fit all clinical situations
    - does not fit all physicians’ needs of decision support
  - the complementarity of automatically triggered alerts and on-demand paradigms to answer physicians’ demands of clinical information (either conscious or not).