An Evidence-Based Integrated Clinical-Assessment and Decision-Support Tool for Oncologists

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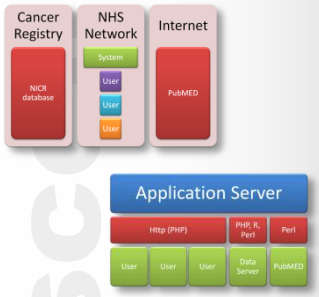
Background: Cancer prognosis and treatment vary with disease type, stage and patient factors, including age and comorbidity. The understanding of these factors is constantly developing and healthcare professionals can find it difficult to stay abreast of the rich volume of evidence-based research generated yearly. The danger is the underestimation of prognosis of terminally ill patients, resulting in inadequate patient care and inadequate patient choices for their future. **Method:** PubMed Clinical Queries were used to automatically retrieve patient-relevant bibliographic references from MEDLINE. The PICO approach (Problem, Intervention, Comparison, Outcome) was loosely used to model query/answer couples. On screen, the clinical query *categories* and MeSH headings/subheadings were used to classify resulting . For each paper, the first line of the conclusion of the abstract was given, embedding a hyperlink to PubMed. **Results:** A fully automated prototype clinical decision support system which provides a selection of peer-reviewed publications filtered on the basis of a patient's profile, in addition to epidemiological data has been developed and tested. **Conclusion:** This project demonstrates an effective method to exploit existing resources to induce a logically consistent hierarchical classification of relevant journal papers, which is informative, intuitive and fast to navigate.

Behind the scenes

•System placed within the NHS network
•Access to PubMED needed
•Feeds from cancer registries will allow for additional features



•Communication with the database is via PHP, R and Perl
•Interrogation of PubMED is via Perl scripts, which periodically populate the database with information from PubMED

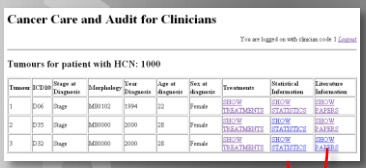
•Clinical Queries are used with a concatenation of strings from the standard description of the characteristics of the tumours
•Entrez EUtils are exploited to retrieve the corresponding XML references and MeSH headings

For instance, for a testicular tumour the following Clinical Query will be automatically generated and used:

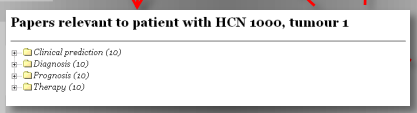
```
(testicular+cancer[mesh])+
AND+(randomized+controlled+
trial[Publication+Type]+OR+
(randomized[Title/Abstract]
+AND+controlled[Title/Abstr
act]+AND+trial[Title/Abstra
ct]))
```

Use example

• A sample, web-based medical information system was created to demonstrate the tool
• It may represent an existing system (such as a Multidisciplinary Team Meeting Management System or a GP System)



• By clicking the link for literature information, a collapsed tree structure organising the literature links retrieved from PubMed for a patient with testicular cancer is shown



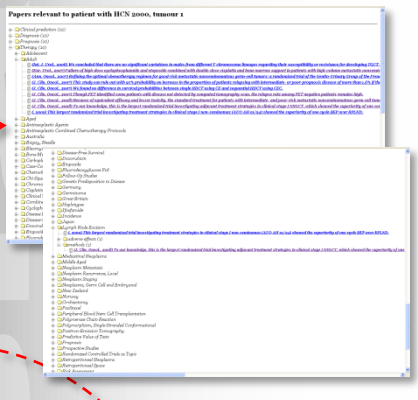
• The papers retrieved by the four categories of clinical queries considered in this project are grouped in the first four nodes of the tree, with the labels displaying the number of unique papers contained in the subtrees

• The PICO structure is loosely used to model query/answer couples:
• ***Question***
  - P (problem/population): patient and disease characteristics
• ***Answers***
  - I (intervention): investigation/treatment/therapy
  - C (comparison): not explicitly applicable
  - O (outcome): post-care/follow-up/mortality/outcome

PICO element	Clinical Query categories
I	Therapy, Diagnosis, Clinical Prediction Guides
C	*This will indirectly emerge from all categories*
O	Prognosis, Clinical Prediction Guides

Output examples

• MeSH headings and subheadings for a sample node are below
• Each link displays the name of the journal with year of publication, followed by the first line of the conclusive section of the paper
• By clicking the link a new tab (or window) of the browser is opened with the PubMed web page of the full abstract for the paper



• Linking to additional resources, such as the Cancer Registry, it is possible to provide
1. population-based information (such as survival) for patients with the same pathology and
2. audit information, such as age and gender distribution for the clinician's patients and all patients in the institution

Way forward

We hope to secure funding to further develop the tool and make it publicly available as an Open Source project.

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Clinical queries System location and architecture