

Sistemi za podporo pri kliničnem odločanju

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Definicija

- ❖ Sistem za podporo pri kliničnem odločanju je vsak računalniški program, ki pomaga zdravstvenim strokovnjakom pri kliničnem odločanju.
- ❖ V splošnem je vsak program, ki obravnava klinične podatke ali medicinsko znanje, sistem za podporo pri odločanju. Vendar, razlikujemo tri nivoje funkcionalnosti.

Orodja za upravljanje z informacijami

- ❖ bolnišnični informacijski sistemi
- ❖ bibliografske baze - Medline
- ❖ elektronski priročniki

Orodja za opozarjanje

- ❖ laboratorijski sistemi, ki alarmirajo ob nenormalnih izvidih;
- ❖ farmakološki sistemi, ki opozarjajo na nezaželjene interakcije med zdravili

Orodja za konzultacije o pacientih

- ❖ pomoč pri diagnosticiranju
- ❖ izbira primernih preiskav
- ❖ nasveti pri izbiri ustrezne terapije

Alternativna definicija

- ❖ Računalniški program, ki daje nasvete za dani primer ali problem na osnovi podatkov o konkretnem pacientu. Pri tem uporablja medicinsko znanje.
- ❖ Pomembne sestavine:
 - ❖ Medicinsko znanje
 - ❖ Podatki o pacientu
 - ❖ Dani primer / problem

Razni vidiki sistemov za podporo pri kliničnem odločanju

❖ **funkcija sistema**

- ❖ ugotoviti kaj je res
- ❖ ugotoviti kaj narediti

❖ **način aktiviranja sistema**

- ❖ pasivni (zdravnik uporabi sistem, ko potrebuje nasvet)
- ❖ aktivni (sistem sam da nasvet pri določenih pogojih)

Pasivni sistemi

- ❖ Uporabnik ima popolno kontrolo
 - ❖ Zahteva nasvet
 - ❖ Analizira rezultate
 - ❖ Sprejme/zavrne nasvet
- ❖ Obseg uporabe
 - ❖ Široka domena kot interna medicina
 - ❖ QMR, DXPLAIN
 - ❖ Omejena domena
 - ❖ Akutne abdominalne bolečine
 - ❖ Analiza EKG

Pasivni sistemi (nadaljevanje)

- ❖ Lastnosti
 - ❖ Samostojni
 - ❖ Vnos podatkov
 - ❖ pobuda sistema
 - ❖ pobuda uporabnika
 - ❖ Način delovanja
 - ❖ Konzultant
 - ❖ Kritik

Aktivni sistemi

- ❖ Uporabnik ima delno kontrolo
 - ❖ Sistem da nasvet
 - ❖ Uporabnik evaluiira nasvet
 - ❖ Uporabnik sprejme/zavrne nasvet
- ❖ Obseg uporabe
 - ❖ Omejena domena
 - ❖ Interakcije med zdravili
 - ❖ Kontrola izvajanja protokolov
 - ❖ Laboratorijski izvidi
 - ❖ Kontrola medicinskih naprav

Aktivni sistemi (nadaljevanje)

- ❖ Lastnosti
 - ❖ Vgrajeni/integrirani z drugim sistemom
- ❖ Vnos podatkov
 - ❖ izvaja uporabnik
 - ❖ v povezavi z glavno aplikacijo
- ❖ Način delovanja
 - ❖ Kritik
- ❖ Primeri:
 - ❖ HELP (nasveti in opozorila, terapija)
 - ❖ CARE (opozorila)

❖ način svetovanja

- ❖ sistem ima vlogo konzultanta
- ❖ sistem ima vlogo kritika
 - ❖ ATTENDING (anestezija)
 - ❖ HELP
 - ❖ ONCOCIN (okologija, načrt zdravljenja)

Mehanizmi delovanja

- ❖ sprogramirani algoritmi
- ❖ razpoznavanje vzorcev
- ❖ statistične metode
- ❖ umetna inteligenca (sistemi podprti z znanjem)
 - ❖ ekspertni sistemi (MYCIN - izbira terapije: bacteremia ali meningitis)
 - ❖ strojno učenje
 - ❖ nevronske mreže
- ❖ odločitvena drevesa
- ❖ produkcijska pravila

Primer odločitvenega drevesa 1

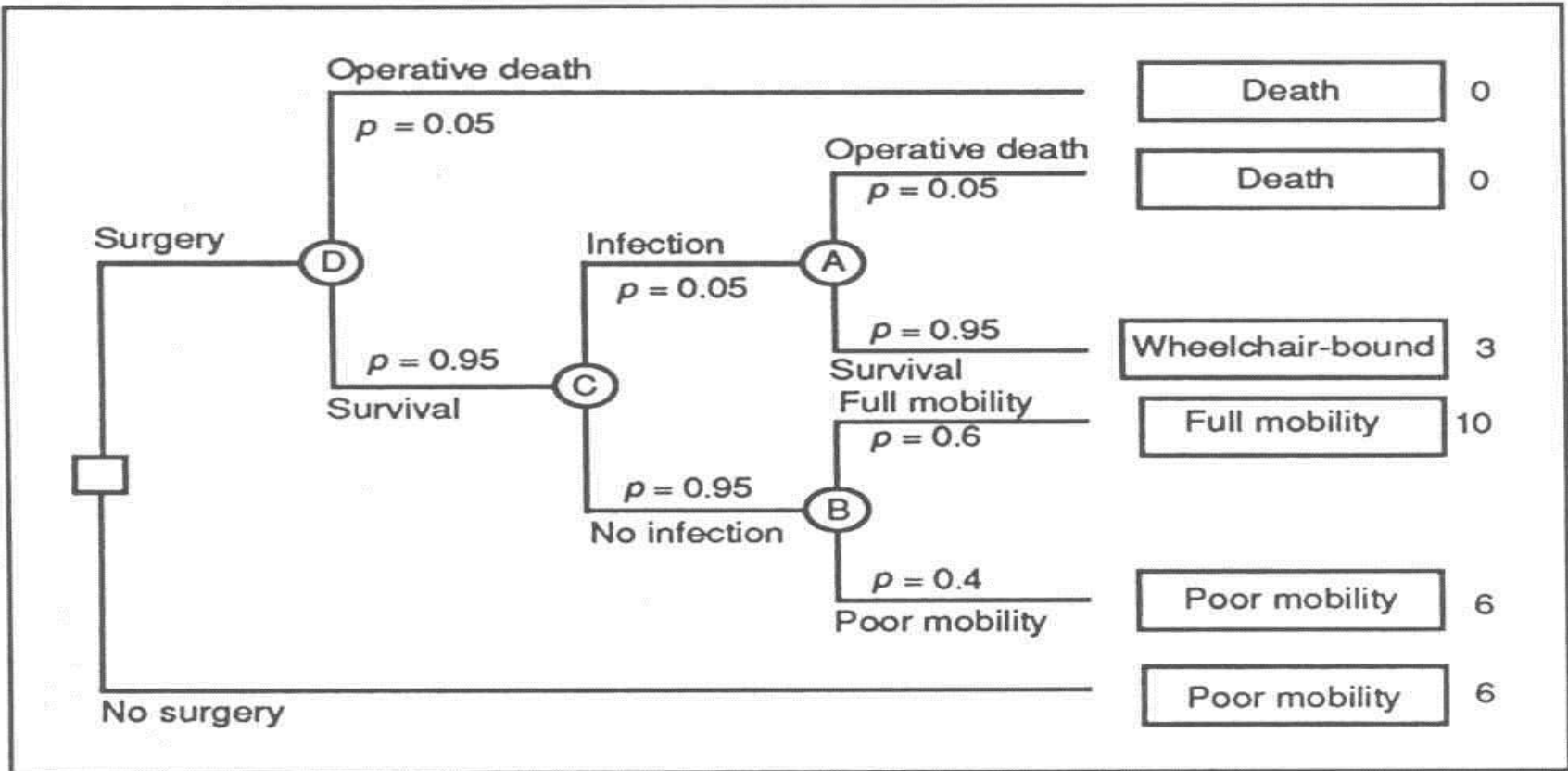


FIGURE 3.10. Decision tree for knee-replacement surgery. Probabilities have been assigned to each branch of each chance node. The patient's valuations of outcomes (measured in years of perfect mobility) are assigned to the tips of each branch of the tree.

Primer odločitvenega drevesa 2

PROGNOSING SURVIVAL TIME OF PATIENTS WITH THYROID CARCINOMA

123

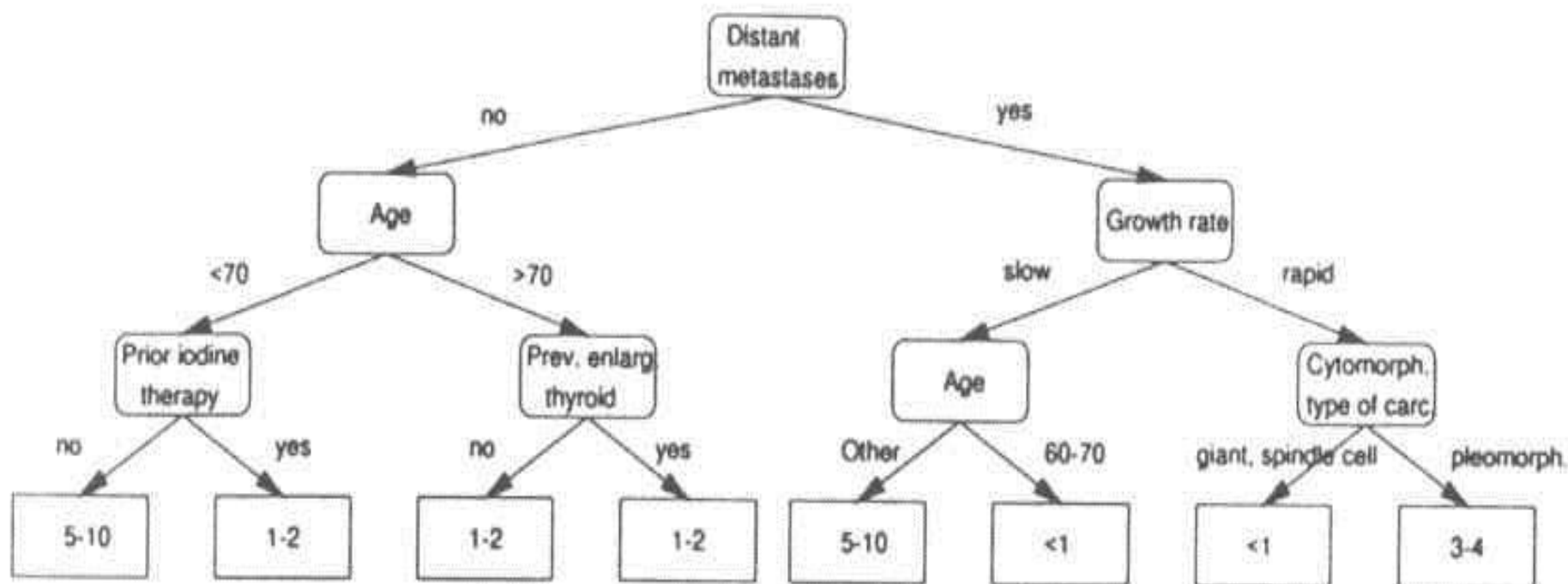


Figure 7.2 Decision tree generated by Assistant-I.

Pr. Odločitvenega pravila 1

Table 3

A selection of rules for early diagnosis of rheumatic diseases induced with CN2 using the *m*-estimate

```
IF    Age < 55
      AND 3 < Duration_of_present_symptoms < 113
      AND Duration_of_rheumatic_diseases < 13
      AND Number_of_swollen_joints < 3
      AND Spinal_pain = spondylotic
      AND Duration_of_morning_stiffness < 1.25
      AND Skin_manifestations = no
THEN  Diagnosis = Degenerative_spine_diseases [58 4 0 0 2 0 1 3]

IF    Sex = female
      AND Age > 47
      AND Joint_pain = arthrotic
      AND Number_of_painful_joints < 19
      AND Spinal_pain = no
THEN  Diagnosis = Degenerative_joint_diseases [3 47 0 0 0 0 2 3]

IF    Sex = male
      AND Number_of_painful_joints < 3
      AND Spinal_pain = spondylitic
THEN  Diagnosis = Inflammatory_spine_diseases [9 0 12 1 0 0 0 1]

IF    Age < 67
      AND Number_of_painful_joints > 1
      AND Number_of_swollen_joints > 0
      AND Other_pain = no
      AND Duration_of_morning_stiffness > 0.35
      AND Skin_manifestations = no
      AND Eye_manifestations = no
THEN  Diagnosis = Other_inflammatory_diseases [2 2 0 11 0 0 0 0]
```


Sistem MYCIN - tipično odločitveno pravilo

Rule507

- IF:
- 1) The infection which requires therapy is meningitis,
 - 2) Organisms were not seen on the stain of the culture,
 - 3) The type of infection is bacterial,
 - 4) The patient does not have a head injury defect, and
 - 5) The age of the patient is between 15 years and 55 years
- THEN: The organisms that might be causing the infection are diplococcus-pneumoniae and neisseria-meningitidis

FIGURE 16.1. A typical rule from the MYCIN system. Rules are conditional statements that indicate what conclusions can be reached or actions taken *if* a specified set of conditions is found to be true. In this rule, MYCIN is able to conclude probable bacterial causes of infection if the five conditions in the premise are all found to be true for a specific patient. Not shown are the measures of uncertainty that are also associated with inference in the MYCIN system.

Sistem MYCIN - primer razlage

In this series, how many of the cultures were positive of the e.coli (ORGANISM-1)?

(typical system prompt)

**** WHY**

(request from user to determine motivation for question)

[i.e. WHY is it important to determine the number of cultures which were positive for the organism?]

(system's rephrasing of the WHY question, and answer)

[1.0] This will help to determine whether there is significant disease associated with this occurrence of the organism.

It has already been established that

[1.1] the culture was taken from a sterile source

[1.2] the number of cultures in the series is greater than 2

Therefore, if

[1.3] the number of cultures which were positive for ORGANISM-1 is greater than 2

Then there is suggestive evidence (.5) that there is significant disease associated with this occurrence of the e.coli (ORGANISM-1).

[RULE049]

**** WHY**

(repeated WHY to determine relevance of previous explanation)

[i.e. WHY is it important to determine if there is significant disease associated with this occurrence of the organism?]

[2.0] This will help to determine a diagnosis for which the infection should be treated.

It has already been established that

[2.1] the infection is not one of: primary bacteremia, meningitis

[2.2] for some current culture of the patient it is true that the site of the culture is blood

Therefore, if

[2.3] there is significant disease associated with this occurrence of the organism

Then

It is definite (1.0) that the diagnosis for which the infection should be treated is secondary-bacterimia

[RULE103]

FIGURE 16.2. Two examples of MYCIN's explanation capabilities. User input is shown in boldface capital letters and follows the double asterisks. The system expands each ["WHY"] question (enclosed in square brackets) to ensure that the user is aware of its interpretation of the query.

Sistem HELP - primer MLM (Medical Logic Module)

```
penicillin_order :=  
    event {medication_order  
          where class = penicillin};  
/* find allergies */  
penicillin_allergy :=  
    read last {allergy  
              where agent_class = penicillin};  
;;  
evolve: penicillin_order ;;  
logic:  
If exist (penicillin_allergy) then conclude true;  
endif;  
;;  
action:  
write  
"Caution, the patient has the following allergy to penicillin documented:"  
|| penicillin_allergy ;;
```

FIGURE 16.3. This medical logic module (MLM), written in the Arden syntax, prints a warning for healthcare workers whenever a patient who reportedly is allergic to penicillin receives a prescription for a drug in the penicillin class. The **evolve** slot defines a situation that causes the rule to be triggered; the **logic** slot encodes the decision logic of the rule; the **action** slot defines the procedure to follow if the logic slot reaches a positive conclusion.

Sistem ONCOCIN - primer protokola zdravljenja

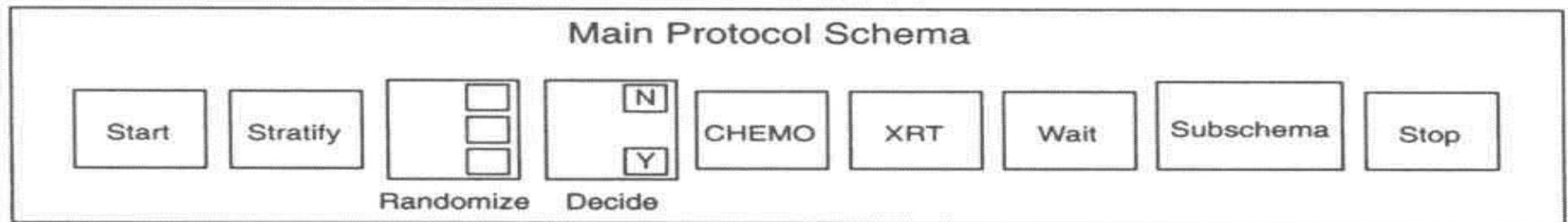
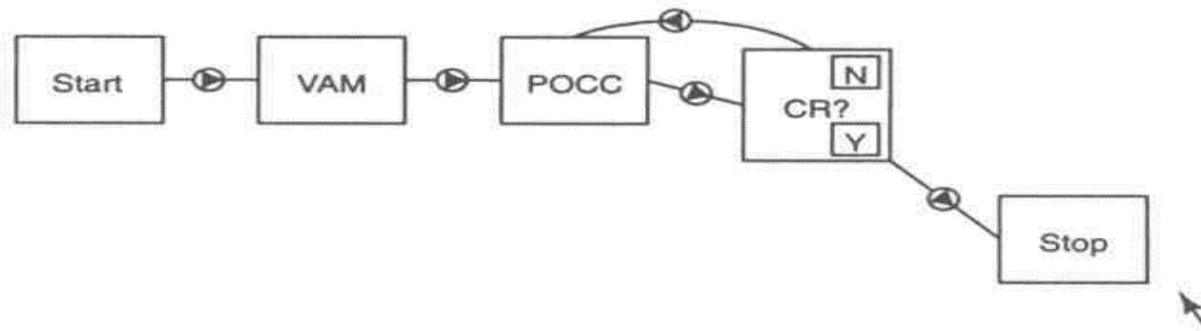


FIGURE 16.4. A clinical researcher can use OPAL to describe the overall schema of an ONCOCIN cancer-treatment plan using the graphical environment shown here. She creates the individual boxes by making selections from the palette of choices at the bottom of the screen and then positions and joins them as desired. The model of cancer chemotherapy built into OPAL determines that possible selections include chemotherapy (CHEMO in the diagram), X-ray therapy (XRT), as well as the idea of randomization and stratification of patients enrolled in clinical trials. The figure shows a relatively simple protocol in which patients are treated with a three-drug chemotherapy called VAM, followed by a four-drug chemotherapy called POCC, until there is complete response (CR).

❖ **človeški faktorji**

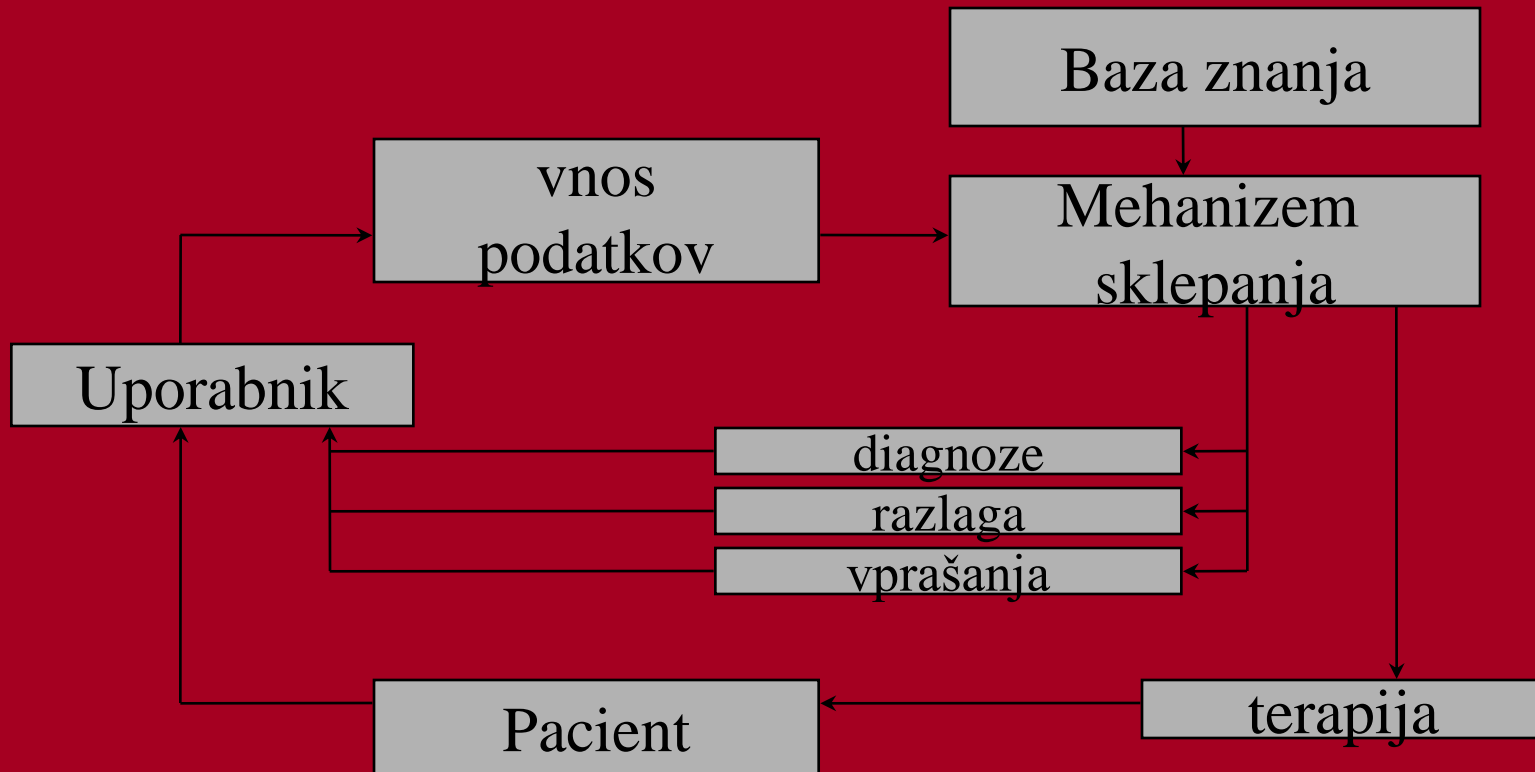
- ❖ logistika
- ❖ uporabniški vmesnik
- ❖ psihologija interakcije človek-računalnik

❖ **pravna vprašanja**

❖ **integracija**

- ❖ samostojni sistemi nimajo prihodnosti
- ❖ podatki morajo biti vnešeni samo enkrat
- ❖ nasveti integrirani v program za rutinsko delo z pacienti

Splošna zgradba kliničnega sistema, ki temelji na znanju



- ❖ **Značilnost sodobnih sistemov za podporo odločanju:**
 - ❖ Uporabljeno medicinsko znanje (baza znanja) ločeno od mehanizmov, ki to znanje uporabljajo (mehanizem sklepanja)
- ❖ **Zajem medicinskega znanja:**
 - ❖ eksperti
 - ❖ medicinska literatura
 - ❖ avtomatično iz medicinskih podatkov (indukcija, strojno učenje)

Praktični primer: DXplain

- ❖ začnemo preko <http://www.mf.uni-lj.si/cmik>

Please click on the hint button below to display additional information



Feedback ...

Click button for hint

Help Feedback Exit

Brief Description of DXplain

DXplain has the characteristics of an electronic medical textbook, a medical reference system and a decision support tool. In the role of a medical textbook, DXplain can provide a comprehensive description and selected references for over 2,000 different diseases, emphasizing the signs and symptoms that occur in each disease, the etiology, the pathology, and the prognosis.

As a decision support tool, DXplain uses its knowledge base of the crude probabilities of over 5,000 clinical manifestations associated with over 2,000 different diseases. The system uses an interactive format to collect clinical information and produces a ranked list of diagnoses which might be associated with the clinical manifestations. DXplain provides justification for each disease, suggests what further clinical information would be useful to collect for each disease and lists what clinical manifestations, if any, would be unusual or atypical for a specific disease.

Please select an option:

Enter a Case For Analysis

Disease / Finding Information

One of the most important features of DXplain on the Web is your ability to send comments, questions and criticisms directly to the developers. Please do so via the Feedback feature, and we will try to respond promptly.

The 'Help' feature can be accessed from each screen, and provides page-specific help for all features found on that page. A summary of DXplain's main functions and features can also be retrieved using 'Help.'

The user can choose to present a case to DXplain (as in this example). By choosing the other option (which is similar to a medical textbook), the program will list the findings that occur in a particular disease, or list the diseases in which a particular finding may occur.

DXplain and DXplain Vocabulary
Massachusetts General Hospital / Harvard Medical School

Odrasli, moški, kronično stanje, slabotnost, togi sklepi, nespečnost

DXplain™ Duration ...
Click button for hint Help Feedback Exit

Start New Case

Is the source of the clinical findings you will enter:
 From an actual case A hypothetical case

Select the most appropriate Item from each of the three categories.

Age	Gender	Duration
Newborn (< 2 MO)	Female	Acute (Hours)
Infant (2 MO TO < 1 YR)	Male	Subacute (few days)
Child (1 to < 12 YRS)		Chronic (> few days)
Adolescent (12 TO < 18 YRS)		
Adult, Young (18 TO 40 YRS)		
Middle Age (41 TO 65 YRS)		
Elderly (> 65 YRS)		

Enter findings separated by ";":
malaise; stiff joints; insomnia

Submit **Reset**

Annotations:

- Knowing whether your case is hypothetical or actual will help the developers better understand how DXplain is used.
- For all cases presented to DXplain, you should provide the patient's age and gender and a rough estimate of the duration of the disease.
- Enter clinical manifestations (signs, symptoms, lab findings) in the box to the left. Separate the findings with a semicolon. When finished entering, click the "Submit" button to proceed.
- Findings are entered in the add findings box using standard medical terminology. Clicking on the 'Submit' button presents the next screen which shows DXplain's matches to the entered findings. More findings can be added later.

New Case Retrv Case Save Case D/F Info

Case Findings

Remove Focus DDx Findings Present?

Current Findings List:

- Malaise
- Chronic (> few days)
- Male
- Adult, young (18 to 40 yrs)

"Malaise" was spelled correctly and since DXplain has no more specific related findings, "malaise" was added directly to the case findings list.

"Stiff joints" was understood as the DXplain finding "joint stiffness". DXplain presents a list of more specific findings that can be selected instead of the general finding entered. In this example, the general finding was kept.

DXplain presents possible matches for the misspelled entry "insomnia".

Pressing the 'Continue' button moves on to the next screen.

● Added to findings list: "MALAISE".

DXplain matched to "stiff joints":
You may change to a more specific finding.

- JOINT STIFFNESS**
- ANKYLOSIS
- BACK STIFFNESS
- EXTREMITY STIFFNESS
- HIP STIFFNESS
- LOWER EXTREMITY STIFFNESS
- FOOT STIFFNESS
- METATARSOPHALANGEAL JOINT STIFFNESS
- KNEE STIFFNESS
- SHOULDER STIFFNESS

DXplain has no exact match for "insomia":
You may click on an item from the possible matches below.

- ABDOMINAL WALL RETRACTION, INSPIRATORY
- AORTIC VALVE REGURGITATION
- DIABETES INSIPIDUS
- EMOTIONAL INSTABILITY
- HAND MOVEMENT SLOWNESS
- ADRENAL INSUFFICIENCY
- INSECT BITE
- INSOMNIA**
- INSPIRATION, PROLONGED
- INSTEP ARTHRITIS

Continue

DXPLAIN predlaga nekaj možnih bolezni, dodan glavobol, znanjšano št.krvnih ploščic

DXplain Findings list checkboxes Click button for hint Help Feedback Exit

New Case Retrv Case Save Case D/F Info

Case Findings
(Remove) (Focus) (DDx) (Findings Present?)
Enter findings separated by ";".
headache; thrombocytopenia
Submit Reset

Current DXplain Disease List
COMMON Diseases:
(Evidence for Dx) (Dx Description) (References)
Arthritis, rheumatoid
Lupus erythematosus, systemic
Fibrositis
-- Alcoholism
-- Polymyalgia rheumatica
-- Chronic fatigue syndrome
-- Herpes zoster
-- Aids, CDC group IV
-- Colitis, ulcerative
-- Enteritis, regional (Crohns disease)

RARE Diseases:
(Evidence for Dx) (Dx Description) (References)
Spondylitis, ankylosing
-- Lymphogranuloma venereum
-- Meningitis, tuberculous
-- Rocky mountain spotted fever
-- Dermatomyositis
-- Arthritis, rheumatoid, juvenile (Still's disease)
-- Creutzfeldt-Jakob disease
-- Reiter syndrome
-- Reticulohistiocytoma, multicentric
-- Mycosis fungoides
-- insufficient information to support this disease

Are these findings present?
 Y N Uk morning stiffness
 Y N Uk sacroiliac tender
 Y N Uk polyserositis

Current Findings List:
 Insomnia
 Joint stiffness
 Malaise
 Chronic (> few days)
 Male
 Adult, young (18 to 40 yrs)
(Remove) (Focus) (DDx) (Findings Present?)

In this example, the user has chosen to add two more findings to the case. These will be added on the next screen once the user clicks on "Submit".

Based on the six findings entered so far, DXplain lists three diseases that might be considered (two common, one rare). Additional diseases are suggested, but are noted as not well supported (these are listed preceded by "--"). These 'not-well-supported diseases' were suggested by one or more of the findings entered, but most of the findings commonly found in these diseases were not present. As other clinical findings are entered, these diseases may move higher on the list because the new findings add support to the diagnosis.

This is one of the chief screens used during a DXplain session since all of the case analysis functions can be accessed from this screen. Since there are too many features to cover on one screen of this demo, many of the features will be reviewed later on in the demo..

Case Findings

Remove **Focus** **DDx** **Findings Present?**

Enter findings separated by " ; ".

Submit **Reset**

Are these findings present?	
<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> Uk	polyserositis
<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> Uk	morning stiffness
<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> Uk	sacroiliac tenderness

Current Findings List:

- Headache, dull
- Thrombocytopenia
- Insomnia
- Joint stiffness
- Malaise
- Chronic (> few days)
- Male
- Adult, young (18 to 40 yrs)

Remove **Focus** **DDx** **Findings Present?**

"Headache, dull" has now been added to the current findings list at left, and Dxplain's differential diagnosis list has been updated at right. One disease is strongly supported, indicated by the + sign, and four others are worth consideration. The diseases in the lower part of the list (indicated by dashes) are suggested by only one or two findings, and are 'long-shots' as a possible diagnosis.

The user selects the disease "Rocky Mountain Spotted Fever" from the list and the "Evidence for Dx" option to see why Dxplain is considering this disease.

Current DXplain Disease List

COMMON Diseases:

Evidence for Dx **Dx Description** **References**

- + Purpura, thrombocytopenic, idiopathic**
- Lupus erythematosus, systemic
- Arthritis, rheumatoid
- Purpura, thrombocytopenic, secondary
- Aids, CDC group IV
- Polymyalgia rheumatica
- Lead poisoning
- Aids, CDC group I
- Chronic fatigue syndrome
- Meningitis, pneumococcal

RARE Diseases:

Evidence for Dx **Dx Description** **References**

- Spondylitis, ankylosing
- Anemia, aplastic
- Rocky mountain spotted fever**
- Leptospirosis
- Mycosis fungoides
- Tuberculosis, miliary
- Leukemia, promyelocytic
- Encephalitis, rubella
- Disseminated intravascular coagulation
- Ornithosis

+ sufficient information to suggest this DX
-- insufficient information to support this disease

Discussion of disease ROCKY MOUNTAIN SPOTTED FEVER. This is a rare disease.

The following findings support this disease:

[MALAISE](#)
[JOINT STIFFNESS](#)
[INSOMNIA](#)
[THROMBOCYTOPENIA](#)
[a type of HEADACHE](#)

The following clinical manifestations (if present) would also support this disease:

[ROTH SPOTS](#)
[RUMPEL LEEDER SIGN POSITIVE](#)
[HEADACHE, SEVERE](#)
[INSECT BITE](#)
[PLANTAR MACULAR ERYTHEMA](#)
[TICK EXPOSURE](#)
[PALMAR RASH](#)
[EXTREMITY MACULAR ERYTHEMA](#)
[EXTREMITY PURPURA](#)
[FACIAL MACULAR ERYTHEMA](#)
[ANKLE MACULAR ERYTHEMA](#)
[ANKLE PURPURA](#)
[WRIST MACULAR ERYTHEMA](#)

Listed first are the findings the user has entered which support the disease "Rocky Mountain Spotted Fever".

Listed next are important findings of the disease which have not been entered nor noted as absent.

The user can click on any of the underlined finding names to see a list of diseases associated with that finding. The next page will present the list for the finding "ROTH SPOTS".

The following lab data (if present) would be useful in establishing the presence of the disease:

[WEIL-FELIX REACTION POSITIVE](#)

Informacije o simptomu

New Case Retrv Case Save Case D/F Info

[Return to Case Analysis page](#)

"ROTH SPOTS" is an important finding which should be strongly considered in creating the differential diagnosis. The following diseases should be considered given the finding "ROTH SPOTS". Note that the position of each disease in a group is arbitrary and does not indicate the degree of support.

This finding very strongly supports the following disease(s):

Common Diseases:

[ENDOCARDITIS, BACTERIAL, SUBACUTE](#)

Rare Diseases:

[ENDOCARDITIS, ACUTE BACTERIAL](#)

This finding strongly supports the following disease(s):

Common Diseases:

[BATTERED CHILD SYNDROME](#)

[CANDIDIASIS, ORAL](#)

[LUPUS ERYTHEMATOSUS, SYSTEMIC](#)

Rare Diseases:

[CARBON MONOXIDE POISONING](#)

[LEISHMANIASIS, VISCERAL](#)

[MYELOMA, MULTIPLE](#)

[ORNITHOSIS](#)

[ROCKY MOUNTAIN SPOTTED FEVER](#)

[TYPHOID FEVER](#)

This finding information page explains that "Roth Spots" is an important finding and presents a list of diseases to be considered if the finding is present.

The user can click on any of the underlined disease names to see DXplain's description of the disease and list of references. In this demonstration, we will now return to the Case Analysis page.

This finding supports the following disease(s):

Common Diseases:

[BRAIN, HEMORRHAGE](#)

[DIABETES MELLITUS, NON-INSULIN DEPENDENT](#)

[HEMATOMA, SUBDURAL, INTRACRANIAL](#)

[AIDS, CDC GROUP IV](#)

[HEMORRHAGE, INTRAVENTRICULAR, NEWBORN](#)

[DIABETES MELLITUS, INSULIN DEPENDENT](#)

Rare Diseases:

[ANEURYSM, MYCOTIC](#)

[AORTITIS, SYPHILITIC](#)

[SCURVY](#)

[LEUKEMIA, MYELOBLASTIC, ACUTE](#)

[MOUNTAIN SICKNESS, ACUTE](#)

Dodana izpostavljenost klopom, pikčaste krvavitve na gležnju

The screenshot displays the DXplain software interface. At the top, there is a navigation bar with buttons for 'New Case', 'Retrv Case', 'Save Case', and 'D/F Info'. A 'DDx' button is highlighted, with a tooltip that says 'Click button for hint'. On the right side, there are buttons for 'Help', 'Feedback', and 'Exit'.

The main interface is divided into two main panels. The left panel, titled 'Case Findings', contains a text input field with the text 'tick exposure; ankle purpura'. Below the input field are 'Submit' and 'Reset' buttons. A tooltip points to the 'Submit' button, stating: 'Two more findings present in this patient are entered. After the user clicks on the "Submit" button, the new findings will be added to the Current Findings List, and the "Current DXplain Disease List" will be updated to reflect the newly added findings. This can be seen on the next screen of this demo.' Below the input field is a section titled 'Are these findings present?' with three rows of radio buttons and labels: 'polyserositis', 'morning stiffness', and 'sacroiliac tenderness'. Each row has radio buttons for 'Y', 'N', and 'Uk', and a small red icon.

The right panel, titled 'Current DXplain Disease List', is divided into two sections: 'COMMON Diseases:' and 'RARE Diseases:'. Each section has sub-sections for 'Evidence for Dx', 'Dx Description', and 'References'. The 'COMMON Diseases:' list includes: '+ Purpura, thrombocytopenic, idiopathic', 'Lupus erythematosus, systemic', 'Arthritis, rheumatoid', 'Purpura, thrombocytopenic, secondary', '-- Aids, CDC group IV', '-- Polymyalgia rheumatica', '-- Lead poisoning', '-- Aids, CDC group I', and '-- Meningitis, pneumococcal'. The 'RARE Diseases:' list includes: 'Spondylitis, ankylosing', '-- Anemia, aplastic', '-- Rocky mountain spotted fever', '-- Leptospirosis', '-- Mycosis fungoides', '-- Tuberculosis, miliary', '-- Leukemia, promyelocytic', '-- Encephalitis, rubella', '-- Disseminated intravascular coagulation', and '-- Ornithosis'. At the bottom of the right panel, there are two lines of text: '+ sufficient information to suggest this DX' and '-- insufficient information to support this disease'.

At the bottom of the interface, there is a footer bar with the text: 'DXplain and DXplain Vocabulary Copyright 1987-1999 Massachusetts General Hospital / Harvard Medical School'.

Pegasta vročica Rocky Mountain je prišla na vrh kandidatov

DXplain Saving a Case ... Click button for hint Help Feedback Exit

New Case Retrv Case Save Case D/F Info

Case Findings

Remove Focus DDx Findings Present?

Enter findings separated by " , ".

Submit Reset

Are these findings present?	
<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> Uk	ankle macular erythema ?
<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> Uk	wrist macular erythema ?
<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> Uk	polyserositis ?

Current Findings List:

- Ankle purpura
- Tick exposure 1
- Headache, dull
- Thrombocytopenia
- Insomnia
- Joint stiffness
- Malaise
- Chronic (> few days)
- Male
- Adult, young (18 to 40 yrs)

Remove Focus DDx Findings Present?

Current DXplain Disease List

COMMON Diseases:
Evidence for Dx Dx Description References

- + Purpura, thrombocytopenic, idiopathic
- + Lupus erythematosus, systemic
- Arthritis, rheumatoid
- Purpura senilis
- Purpura, thrombocytopenic, secondary
- Heparin toxicity
- Arthritis, gonococcal
- Aids, CDC group IV
- Aids, CDC group I
- Chronic fatigue syndrome

RARE Diseases:
Evidence for Dx Dx Description References

- ++ Rocky mountain spotted fever**
- + Ehrlichiosis
- + Lyme disease: early/mid
- Lyme disease, late
- Babesiosis
- Pneumonia, tularemic
- Typhus, scrub
- Henoch-schoenlein purpura
- Bartonellosis
- Spondylitis, ankylosing

++ sufficient information to strongly support this DX
+ sufficient information to suggest this DX
-- insufficient information to support this disease

One disease is now very strongly supported by the findings entered, four more are strongly supported and others are worth consideration.

The user selects a disease name from the list, and the "Disease Description" function to see a disease description generated from DXplain's database.

New Case Retrv Case Save Case D/F Info

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Evidence for Dx

References

ROCKY MOUNTAIN SPOTTED FEVER (RARE)

OTHER NAMES

Fever, spotted; Fever, tick; Typhus, tick; Fiebre manchada; Fiebre petequial; Fiebre maculosa.

ETIOLOGY

Rickettsia rickettsii; transmitted by bite of tick or contact with tick blood or feces on unbroken skin; evidence of aerosol transmission by respiratory route in laboratory workers; tick vector and reservoir; rodents, rabbits reservoirs.

ASSOCIATED TERMS AND CONDITIONS

SOMETIMES: tick exposure; insect bite; summer; male; spring; blood coagulation defect.

RARELY: congestive heart failure; cardiovascular abnormality.

MAKE DIAGNOSIS LESS LIKELY: winter; autumn.

SYMPTOMS

USUALLY: nausea; generalized myalgia; headache; malaise; rigor; prostration; insomnia; sleep disturbance; sudden onset of symptoms.

SOMETIMES: headache; severe; anorexia; constipation; joint stiffness; arthralgia; back pain; photophobia; chills; weakness, generalized; anxiety; irritability; cough; vomiting; abdominal pain; oliguria; confusion; consciousness disturbance; delirium; stupor; muscular rigidity; hearing impairment; lightheadedness.

RARELY: abdominal pain; right upper quadrant; flank pain; kidney disease; renal failure; coma; hypersomnia.

PHYSICAL FINDINGS

USUALLY: ankle macular erythema; ankle purpura; wrist macular erythema; facial macular erythema; dehydration; fever; skin erythema; maculopapular erythema; skin lesion(s) or rash; generalized rash.

SOMETIMES: palmar rash; plantar macular erythema; spleen enlargement; hypotension; muscle tenderness; meningismus; agitation; cyanosis; ecchymosis;

DXplain's "textbook" description of RMSF is presented. The description is generated from DXplain's database. References follow the description.

Since the disease description is too long to fit on one page of this demo, the next two screens will show the remainder.

----- **PHYSICAL FINDINGS** -----

USUALLY: ankle macular erythema; ankle purpura; wrist macular erythema; facial macular erythema; dehydration; fever; skin erythema; maculopapular erythema; skin lesion(s) or rash; generalized rash.

SOMETIMES: palmar rash; plantar macular erythema; spleen enlargement; hypotension; muscle tenderness; meningismus; agitation; cyanosis; ecchymosis; palmar erythema; upper extremity rash; sole rash; Rumpel Leede sign positive; abdominal distention; hepatosplenomegaly; hepatomegaly; liver tenderness; peristaltic sound decrease; shock; back tenderness; scrotal rash; skin ulceration.

RARELY: Roth spots; flank tenderness; abdominal tenderness; scrotal ulceration; gangrene; seizure; unresponsiveness; jaundice.

ADDITIONAL NOTES: Incubation 3-12 days; flushing of skin; macular bright red lesions, appearing on wrists, ankles, later becoming generalized; later petechial, possibly hemorrhagic lesions; fever high during second week.

----- **LABORATORY FINDINGS** -----

SOMETIMES: Weil-Felix reaction positive; thrombocytopenia; hypoxia; prolonged bleeding time; leukocytes decreased; hematocrit increased; monocytes, increased; hypoalbuminemia.

RARELY: blood urea nitrogen elevated; creatinine, elevated; serum total bilirubin elevated; SGOT (AST), elevated; alkaline phosphatase, elevated; serum conjugated bilirubin elevated; SGPT (ALT), elevated; serum creatine phosphokinase BB fraction elevated.

ADDITIONAL NOTES: Complement fixation test positive.

----- **DIAGNOSTICALLY HELPFUL** -----

VERY STRONGLY SUPPORTS: ankle macular erythema; ankle purpura; Rumpel Leede sign positive; wrist macular erythema; tick exposure; palmar rash.

STRONGLY SUPPORTS: extremity macular erythema; extremity purpura; facial macular erythema; headache, severe; insect bite; plantar macular erythema; Weil-Felix reaction positive; Roth spots.

----- **COURSE** -----

Prognosis: in mild or moderately grave forms, subsidence within two weeks; possibly bronchopneumonia; pneumonitis; otitis media; parotitis; heart failure; hemorrhages from nose, intestine, kidney; iritis; acute nephritis; hemiplegia; concurrent infections; in fatal cases, death occurring during second week from toxemia, vasomotor weakness, shock or renal failure.

----- **PATHOLOGY** -----

Endothelial proliferation of capillaries, thrombosis; mononuclear infiltration within heart, liver, spleen, alveoli; arterial infarction.

----- **REFERENCES** -----

1. Rocky Mountain spotted fever: a present-day perspective [comment]. *Medicine (Baltimore)* 1992 Jul;71(4):255-9

This is the second page of DXplain's Disease Description of Rocky Mountain Spotted Fever.

----- REFERENCES -----

1. [Rocky Mountain spotted fever: a present-day perspective \[comment\].](#) *Medicine (Baltimore)* 1992 Jul;71(4):255-9
2. [Rocky Mountain spotted fever. When and why to consider the diagnosis.](#) *Postgrad Med* 1990 Mar;87(4):109-18
3. [Rocky Mountain spotted fever. A clinical review based on 48 confirmed cases, 1943-1986.](#) *Medicine (Baltimore)* 1990 Jan;69(1):35-45
4. [Meningoencephalitis as a major manifestation of Rocky Mountain spotted fever.](#) *South Med J* 1988 Jul;81(7):915-8
5. [Petechial rash in toxic-appearing young man. Rocky Mountain spotted fever \(RMSF\).](#) *Arch Dermatol* 1991 Jul;127(7):1049, 1052-3
6. [Heterophile antibodies and the diagnosis of Rocky Mountain spotted fever.](#) *J Fam Pract* 1987 May;24(5):529-30
7. [When to be rash about a fever and headache.](#) *Chest* 1986 Aug;90(2):290-1
8. [The sensitivity of various serologic tests in the diagnosis of Rocky Mountain spotted fever.](#) *Am J Trop Med Hyg* 1986 Jul;35(4):840-4
9. [Rocky Mountain spotted fever presenting as thrombotic thrombocytopenic purpura.](#) *Am J Med* 1986 Jul;81(1):153-7
10. [A focus of Rocky Mountain spotted fever within New York City.](#) *N Engl J Med* 1988 May 26;318(21):1345-8

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