Εργαστήριο Βιοϊατρικής Τεχνολογίας : Άσκηση 3

Ονοματεπώνυμο: Αλεξοπούλου Γεωργία

ΑΜ: 03120164

Μέρος Α

Σκοπός της εργασίας είναι η εξοικείωση με τη γλώσσα προγραμματισμού R, συγκεκριμένα σε ότι αφορά την εύρεση πληροφοριών από τη βιβλιοθήκη της PUBmed. Αρχικά, ασχολούμαστε με την άντληση λημμάτων που αναφέρονται στον όρο "e-prescription", για το έτος 2014 (αφού το τελευταίο ψηφίο του ΑΜ μου ισούται με 4). Αυτό επιτυγχάνεται με τη χρήση της εντολής *EUtilsSummary*, η οποία επιστρέφει το κάτωθι summary, με πληροφορίες για τον όρο "e-prescription" αλλά και τον αριθμό αναφορών του για το συγκεκριμένο έτος:

```
> summary(search_query)
Query:
("electronic prescribing"[MeSH Terms] OR ("electronic"[All Fields] AND "prescribing"[Al
l Fields]) OR "electronic prescribing"[All Fields] OR "e prescription"[All Fields]) AND
2014/01/01:2014/12/31[Date - Entry]

Result count:  564
```

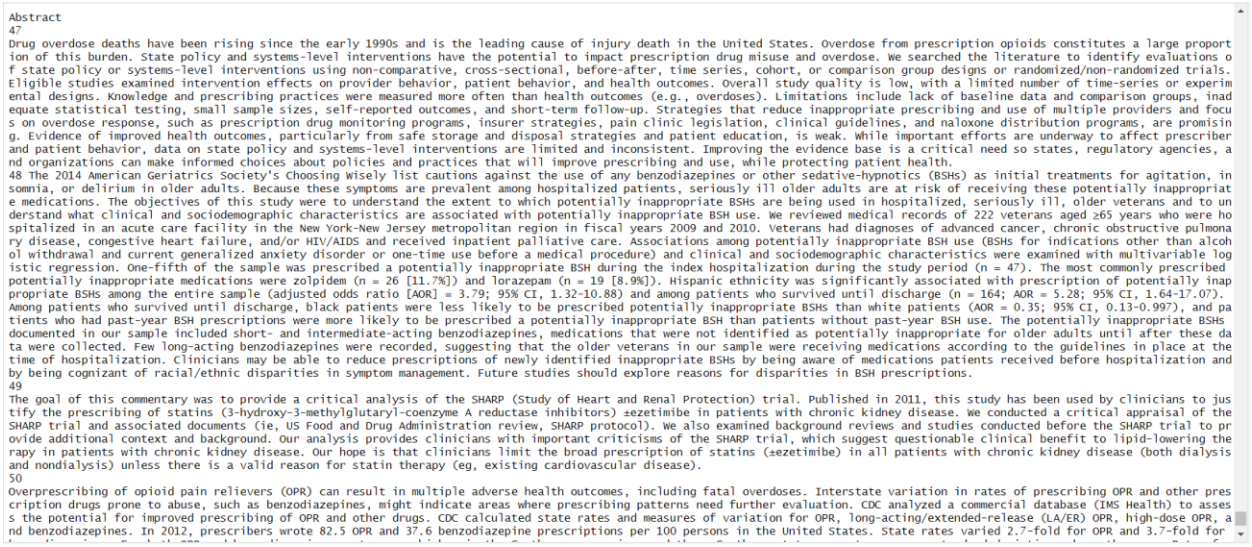
Στη συνέχεια, για να εκτυπώσουμε τα Ids των άρθρων που συλλέξαμε, αξιοποιούμε την εντολη *QueryId* και τυπώνουμε τα ID αυτών των άρθρων, λαμβάνοντας τα εξής αποτελέσματα:

```
> QueryId(search_query) #IDs of collected articles
 [1] "25547090" "25542709" "25540033" "25539495" "25535164" "25533870" "25529863"
 [8] "25528711" "25528430" "25527272" "25526759" "25525200" "25522888" "25515217"
[15] "25510488" "25504295" "25500915" "25500217" "25498781" "25498774" "25498773"
[22] "25498534" "25497472" "25497468" "25497462" "25488107" "25483575" "25482998"
[29] "25477615" "25477566" "25474334" "25468314" "25467569" "25466971" "25466592"
[36] "25465970" "25463699" "25460526" "25460338" "25459209" "25458923" "25458444"
[43] "25456685" "25456156" "25456023" "25455248" "25454406" "25453732" "25453731"
[50] "25453186"
```

Συνεχίζουμε τυπώνοντας τους τίτλους των πρώτων 20 άρθρων της αναζήτησής μας:

```
> #Titles of first 20 articles
> pubmed_data<-data.frame('Title'=ArticleTitle(records))
> head(pubmed_data, 20)
                                                                                                                          Title
1                                                                            Use of electronic health records to support smoking cessation.
2                                                                                      [Blood components and good practices in transfusion].
3                                               Need to know: the need for cognitive closure impacts the clinical practice of obstetrician/gynecologists.
4                                                                 Barriers and facilitators to recovering from e-prescribing errors in community pharmacies.
5     [Potentially inappropriate prescribing cardiovascular medications in the aged population: prospective study in a district hospital centre (France)].
6                                                                  Taking pills for developmental ails in Southern Brazil: The biologization of adolescence?
7                                       Adherence to prescription opioid monitoring guidelines among residents and attending physicians in the primary care setting.
8                                                                        Increased evidence-based tobacco treatment through Oklahoma hospital system changes.
9                                        Remarkable quantitative and qualitative differences in HDL after niacin or fenofibrate therapy in type 2 diabetic patients.
10                                                                     An international cross-sectional survey of antimicrobial stewardship programmes in hospitals.
11                                                Use of an Electronic Medical Record (EMR) to Identify Glycemic Intensification Strategies in Type 2 Diabetes.
12 Association between oral fluoroquinolone use and the development of retinal detachment: a systematic review and meta-analysis of observational studies.
13                                                                                         A multicenter study of plasma use in the United States.
14        A multifaceted quality improvement intervention for CVD risk management in Australian primary healthcare: a protocol for a process evaluation.
15       [Theory of action on patient relationships. A different way of representing and understanding the behaviour of the family doctor in the clinic].
16    Could home sexually transmitted infection specimen collection with e-prescription be a cost-effective strategy for clinical trials and clinical care?
17                                                                  A continuous quality improvement initiative for electronic prescribing in ambulatory care.
18                                                 [Prevalence of performing and prescribing physical exercise in patients diagnosed with anxiety and depression].
19                                                                  Capitalizing on prescribing pattern variation to compare medications for type 2 diabetes.
20                                                                     Cost-effectiveness of telaprevir in patients with genotype 1 hepatitis C in Australia.
```

καθώς και τα abstracts των 4 τελευταίων:



Abstract
47
Drug overdose deaths have been rising since the early 1990s and is the leading cause of injury death in the United States. Overdose from prescription opioids constitutes a large proportion of this burden. State policy and systems-level interventions have the potential to impact prescription drug misuse and overdose. We searched the literature to identify evaluations of state policy or systems-level interventions using non-comparative, cross-sectional, before-after, time series, cohort, or comparison group designs or randomized/non-randomized trials. Eligible studies examined intervention effects on provider behavior, patient behavior, and health outcomes. Overall study quality is low, with a limited number of time-series or experimental designs. Knowledge and prescribing practices were measured more often than health outcomes (e.g., overdoses). Limitations include lack of baseline data and comparison groups, inadequate statistical testing, small sample sizes, self-reported outcomes, and short-term follow-up. Strategies that reduce inappropriate prescribing and use of multiple providers and focus on overdose response, such as prescription drug monitoring programs, insurer strategies, pain clinic legislation, clinical guidelines, and naloxone distribution programs, are promising. Evidence of improved health outcomes, particularly from safe storage and disposal strategies and patient education, is weak. While important efforts are underway to affect prescriber and patient behavior, data on state policy and systems-level interventions are limited and inconsistent. Improving the evidence base is a critical need so states, regulatory agencies, and organizations can make informed choices about policies and practices that will improve prescribing and use, while protecting patient health.
48 The 2014 American Geriatrics Society's Choosing Wisely list cautions against the use of any benzodiazepines or other sedative-hypnotics (BSHs) as initial treatments for agitation, insomnia, or delirium in older adults. Because these symptoms are prevalent among hospitalized patients, seriously ill older adults are at risk of receiving these potentially inappropriate medications. The objectives of this study were to understand the extent to which potentially inappropriate BSHs are being used in hospitalized, seriously ill, older veterans and to understand what clinical and sociodemographic characteristics are associated with potentially inappropriate BSH use. We reviewed medical records of 222 veterans aged ≥65 years who were hospitalized in an acute care facility in the New York-New Jersey metropolitan region in fiscal years 2009 and 2010. Veterans had diagnoses of advanced cancer, chronic obstructive pulmonary disease, congestive heart failure, and/or HIV/AIDS and received inpatient palliative care. Associations among potentially inappropriate BSH use (BSHs for indications other than alcohol withdrawal and current generalized anxiety disorder or one-time use before a medical procedure) and clinical and sociodemographic characteristics were examined with multivariable logistic regression. One-fifth of the sample was prescribed a potentially inappropriate BSH during the index hospitalization during the study period (n = 47). The most commonly prescribed potentially inappropriate medications were zolpidem (n = 26 [11.7%]) and lorazepam (n = 19 [8.9%]). Hispanic ethnicity was significantly associated with prescription of potentially inappropriate BSHs among the entire sample (adjusted odds ratio [AOR] = 3.79; 95% CI, 1.32-10.88) and among patients who survived until discharge (n = 164; AOR = 5.28; 95% CI, 1.64-17.07). Among patients who survived until discharge, black patients were less likely to be prescribed potentially inappropriate BSHs than white patients (AOR = 0.35; 95% CI, 0.13-0.997), and patients who had past-year BSH prescriptions were more likely to be prescribed a potentially inappropriate BSH than patients without past-year BSH use. The potentially inappropriate BSHs documented in our sample included short- and intermediate-acting benzodiazepines, medications that were not identified as potentially inappropriate for older adults until after these data were collected. Few long-acting benzodiazepines were recorded, suggesting that the older veterans in our sample were receiving medications according to the guidelines in place at the time of hospitalization. Clinicians may be able to reduce prescriptions of newly identified inappropriate BSHs by being aware of medications patients received before hospitalization and by being cognizant of racial/ethnic disparities in symptom management. Future studies should explore reasons for disparities in BSH prescriptions.
49
The goal of this commentary was to provide a critical analysis of the SHARP (Study of Heart and Renal Protection) trial. Published in 2011, this study has been used by clinicians to justify the prescribing of statins (3-hydroxy-3-methylglutaryl-coenzyme A reductase inhibitors) ±ezetimibe in patients with chronic kidney disease. We conducted a critical appraisal of the SHARP trial and associated documents (ie, US Food and Drug Administration review, SHARP protocol). We also examined background reviews and studies conducted before the SHARP trial to provide additional context and background. Our analysis provides clinicians with important criticisms of the SHARP trial, which suggest questionable clinical benefit to lipid-lowering therapy in patients with chronic kidney disease. Our hope is that clinicians limit the broad prescription of statins (±ezetimibe) in all patients with chronic kidney disease (both dialysis and nondialysis) unless there is a valid reason for statin therapy (eg, existing cardiovascular disease).
50
Overprescribing of opioid pain relievers (OPR) can result in multiple adverse health outcomes, including fatal overdoses. Interstate variation in rates of prescribing OPR and other prescription drugs prone to abuse, such as benzodiazepines, might indicate areas where prescribing patterns need further evaluation. CDC analyzed a commercial database (IMS Health) to assess the potential for improved prescribing of OPR and other drugs. CDC calculated state rates and measures of variation for OPR, long-acting/extended-release (LA/ER) OPR, high-dose OPR, and benzodiazepines. In 2012, prescribers wrote 82.5 OPR and 37.6 benzodiazepine prescriptions per 100 persons in the United States. State rates varied 2.7-fold for OPR and 3.7-fold for

<u>Μέρος Β</u>

Σε αυτό το μέρος της άσκησης, πρέπει να διαβάσουμε ένα αρχείο CSV, κάνοντας αναζήτηση ορισμένων κωδικών. Οι κωδικοί αυτοί (A164, G164) εξαρτώνται από τον αριθμό μητρώου, ωστόσο δεν υπάρχουν στο δοθέν αρχείο, επομένως θα δουλέψουμε με τους κωδικούς A64, G64 και M5800. Τυπώνουμε τις ονομασίες των ασθενειών που αντιστοιχούν στους κωδικούς αυτούς, αξιοποιώντας τις εντολές που φαίνονται παρακάτω:

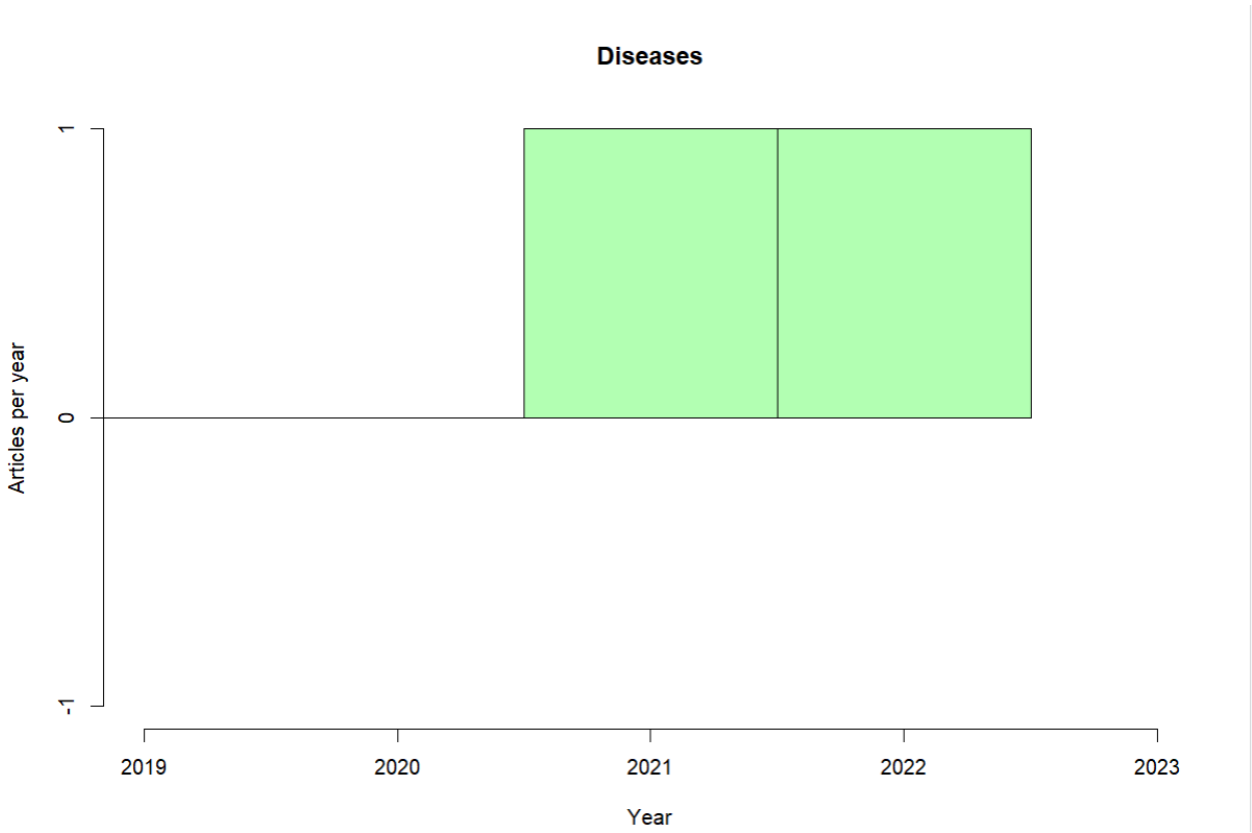
```
> #install.packages('readr')
> library(readr)
> data<- read.csv(file ='icd10.csv', header = TRUE,sep = ";")
>
> #Code A164
> Obect_1 = data[55, 2]
> print(Obect_1)
[1] "Amebic liver abscess"
>
> #Code G64
> Object_2 = data[5406,2]
> print(Object_2)
[1] "Myogenic ptosis of bilateral eyelids"
>
> #Code M8500
> Object_3 = data[19694,2]
> print(Object_3)
[1] "Matern care for disproprtn due to hydrocephalic fetus, unsp"
>
```

Θέλουμε, επίσης, να τυπώσουμε τον συνολικό αριθμό των Abstracts που εμπεριέχονται στην PUBmed και αναφέρονται στις παραπάνω 3 ασθένειες, στο διάστημα των τελευταίων 4 χρόνων. Θα θεωρήσουμε πως κάθε άρθρο συνοδεύεται από ένα Abstract, καθώς χωρίς αυτή την παραδοχή η συγκεκριμένη αναζήτηση θα γινόταν πολύ περίπλοκη. Έτσι, ακολουθώντας παρόμοια λογική αναζήτησης με αυτή του *Μέρους Α*, βρίσκουμε τις εξής αναφορές σε κάθε ασθένεια:

```
> number_of_abstracts(Object_1)
[1] 0
Warning message:
In any(is.na(WhichArgs)) || sapply(WhichArgs, length) > 1 :
  'length(x) = 2 > 1' in coercion to 'logical(1)'
> number_of_abstracts(Object_1)
[1] 0
Warning message:
In any(is.na(WhichArgs)) || sapply(WhichArgs, length) > 1 :
  'length(x) = 2 > 1' in coercion to 'logical(1)'
> number_of_abstracts(Object_2)
[1] 7
Warning message:
In any(is.na(WhichArgs)) || sapply(WhichArgs, length) > 1 :
  'length(x) = 2 > 1' in coercion to 'logical(1)'
> number_of_abstracts(Object_3)
[1] 0
Warning message:
In any(is.na(WhichArgs)) || sapply(WhichArgs, length) > 1 :
  'length(x) = 2 > 1' in coercion to 'logical(1)'
>
```

Σχετικά με το historygram, χρησιμοποιούμε τη συνάρτηση hit, έχοντας χρησιμοποιήσει την παραπάνω πληροφορία για τον αριθμό αναφορών της κάθε ασθένειας στο διάστημα 2021-2023. Παρακάτω φαίνεται τόσο ο κώδικας που χρησιμοποιήθηκε, όσο και το διάγραμμα που προκύπτει:

```
> get1 <- EUtilsGet(Data_1)
> Years1 <- YearPubmed(get1)
> hist(Years1, main = 'Diseases', ylab='Articles per year',xlab='Year',border='Black',col=rgb(1,0,0,0.3),xlim = c(2019,202
3), breaks = seq(2018.5,2022.5,1))
>
> Data_2 <- EUtilsSummary(Object_2, mindate = 2021, maxdate = 2023)
Warning message:
In any(is.na(WhichArgs)) || sapply(WhichArgs, length) > 1 :
  'length(x) = 2 > 1' in coercion to 'logical(1)'
> get2 <- EUtilsGet(Data_2)
> Years2 <- YearPubmed(get2)
> hist(Years2, ylab='Articles per year',xlab='Year',border='Black',col=rgb(0,1,0,0.3),xlim = c(2019,2023), breaks = seq(201
8.5,2022.5,1),add = TRUE)
>
> Data_3 <- EUtilsSummary(Object_3, mindate = 2021, maxdate = 2023)
Warning message:
In any(is.na(WhichArgs)) || sapply(WhichArgs, length) > 1 :
  'length(x) = 2 > 1' in coercion to 'logical(1)'
> get3 <- EUtilsGet(Data_3)
> Years3 <- YearPubmed(get3)
> hist(Years3,  ylab='Articles per year',xlab='Year',border='Black',col=rgb(0,0,1,0.3),xlim = c(2019,2023), breaks = seq(201
8.5,2022.5,1),add = TRUE)
```



Τελευταίο ζητούμενο είναι η σχεδίαση του Treemap. Για το ερώτημα αυτό εισάγουμε τη βιβλιοθήκη treemap. Γενικώς, η σχεδίαση ενός τέτοιου γραφήματος χωρίζεται σε 3 επί μέρους βήματα:

- Δημιουργία διανύσματος group: αξιοποιούμε διάνυσμα το οποίο αποτελείται από 6 values (2x το όνομα κάθε group), με σκοπό σε κάθε group να μπορούν να αντιστοιχιστούν 2 subgroups.
- Δημιουργία διανύσματος subgroups: σχεδιάζουμε αρχικά ένα διάνυσμα με values τις χρονολογίες που μας ενδιαφέρουν (2022-2023)
- Δημιουργία διανύσματατος treemap values: αξιοποιούμε τα διανύσματα των subgroups που περιέχουν το έτος γραφής του άρθρου.

Έτσι, προκύπτει το παρακάτω κομμάτι κώδικα:

```
#install.packages('treemap')
library(treemap)

group <- c(rep(Object_1,3),rep(Object_2,3),rep(Object_3,3))
subgroup <- c(2022, 2023)

#Creating three vectors that have all the appearances of each article per year

Treemap1<-table(Years1)
Treemap_Values_1<-unname(Treemap1)
Treemap2<-table(Years2)
Treemap_Values_2<-unname(Treemap2)

#Combining these vectors into one

Treemap_values <- c(Treemap_Values_1,Treemap_Values_2)

#Plotting the treemap

data_treemap <- data.frame(group,subgroup,Treemap_values)
treemap(data_treemap, index =c('group','subgroup'), vSize = 'Treemap_values',type = 'index')
```