

Data Impact Challenge Answer Submission Template

Template:

- Question: For what portion of adults is a dual energy X-ray absorptiometry (DEXA) scans repeated more often than every 2 years?
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Describing the Data and Analysis

- Data Custodian Organization: St. Michael's Hospital Department of Medical Imaging
- Datasets Used: St. Michael's Department of Medical Imaging database- Montage RIS search engine data for all bone mineral density scans
- Inclusion: Adult (> 18 years of age) patients that have had at least one DEXA scan
- Nature and Size of Cohort (e.g. geographic area covered, number of patients included): St. Michael's hospital is a high risk osteoporosis centre that serves a large urban patient population serving inner-city patients in Toronto
- Data timeframe: May 11 2005 to May 11 2015

Please provide a brief summary of the analysis methodology:

All radiology reports of adult patients admitted for scanning between May 11 2005 and 2015 to an academic medical centre in Canada (St. Michael's Hospital) were reviewed using the Montage RIS search engine. Adult patients were identified for inclusion in the analysis if they have undergone at least one dual energy X-ray absorptiometry (DEXA) scan. For each identified patient that met the inclusion criteria the following information was determined, total number of DEXA scans and average number of days between each DEXA scan. A patient that has undergone scanning more than once in a two year interval as recommended by Choosing wisely Canada Rheumatology recommendation (<http://www.choosingwiselycanada.org/recommendations/rheumatology/>) were identified. A summary statistic was done that examined the proportion of patients that have undergone a DEXA scan more frequently than the recommended time interval (2 years) to the overall number of patients that have received a DEXA scan. The program written to determine the results can be found in Appendix I.

Describing the Findings

Description	Result
Total number of DEXA scans	56 483
Number of unique patients that underwent a DEXA scan	26 362
Number of patients that underwent more than one DEXA scan	12 734
Average number of days between DEXA scans in the same patient	744
Number of patients that have undergone ANY of their DEXA scans more frequently than 2 years	7 706
Number of patients that have undergone ALL of their DEXA scans more frequently than 2 years	3 788
Proportion of patients that have undergone ANY of their DEXA scans more frequently than 2 years (figure in parentheses indicates proportion excluding patients who have only undergone a single DEXA scan)	29% (61%)
Proportion of patients that have undergone ALL of their DEXA scans more frequently than 2 years (figure in parentheses indicates proportion excluding patients who have only undergone a single DEXA scan)	14% (30%)

Our findings suggest 61% of patients that have undergone at least two DEXA scans at St. Michael's hospital did so at a more frequent interval than every 2 years. Of note, the average interval between any two DEXA scans for a single patient is 744 days which is above the 2 year recommendation. A key limitation to these findings is that the data was collected from an academic centre. St. Michael's hospital is a high risk osteoporosis centre and conducts a number of clinical trials for pharmaceutical agents. This may result in trial patients undergoing DEXA scan more frequently than the guideline recommendations. In addition, the scanning patterns may vary between academic and community centres and therefore may not be representative of other environments. It was assumed that patients undergoing a DEXA scan at St. Michael's hospital would schedule follow up scans at the same centre. Therefore, this result maybe a conservative estimate as some patients may have undergone follow up scans at a different centre. Our results suggest that a large proportion of patients (61%) receiving care at an urban academic centre receive DEXA scanning more frequently than the rheumatology guideline recommendations by Choosing Wisely Canada.

Appendix I – Program written to solve the challenge (Python 2.7)

```
#56483 studies spanning May 11 2005 - May 11 2015
import numpy

countAny = 0
countAll = 0
oneTimers = 0
twoTimers = 0
sumDiff = numpy.array([10],dtype='int64')

lenDiff = 0
arr = numpy.loadtxt(open("all2.csv","rb"),dtype='string',delimiter=",",skiprows=1)

mrn = numpy.unique(arr[:, 3])
population = len(mrn) # 26362 patients

for patient in mrn:
    patientexams = numpy.where(arr == patient)[0]

    dates = [] # initialize dates array for each patient

    for exam in patientexams:
        dates.append(int(arr[exam][5]))

    if len(dates) > 1:

        if len(dates) == 2:
            twoTimers += 1

            difference = abs(numpy.diff(dates)) # take the absolute difference of each
            exam date for comparison

            sumDiff += numpy.sum(difference) # adds the difference and counts the lengths
            to calculate average
            lenDiff += len(difference)

            differenceArr = difference < 63072000 # compare each element in the
            difference array to see if it is less than 2 years

            if(differenceArr.any()): # if ANY exams were done with interval < 2 years
                countAny += 1

            if(differenceArr.all()): # if ALL exams were done with interval < 2 years
                countAll += 1

    else:
        oneTimers += 1

print "Population: " + str(population)
print "OneTimers: " + str(oneTimers)
print "ProportionOneTimers: " + str(oneTimers/float(population))
print "TwoTimers: " + str(twoTimers)
print "ProportionTwoTimers: " + str(twoTimers/float(population))
```

```
print "CountAny: " + str(countAny)
print "ProportionAny: " + str(countAny/float(population))

print "CountALL: " + str(countAll)
print "ProportionALL: " + str(countAll/float(population))

print "Average Interval: " + str(sumDiff/float(lenDiff)/24/60/60) #days
```

Output:

```
Population: 26362
OneTimers: 13628
ProportionOneTimers: 0.516956224869
TwoTimers: 5306
ProportionTwoTimers: 0.201274561869
CountAny: 7706
ProportionAny: 0.292314695395
CountAll: 3788
ProportionAll: 0.143691677414
Average Interval: [ 744.20156322]
```