# Association Rules Mining Based Clinical Observations

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## Abstract

*Healthcare institutes enrich the repository of patients' disease and/or risk factor related information in an increasing manner which could have been more useful by carrying out relational analysis. In this paper we have implemented Association Rules mining based a novel observation technique for finding co-occurrences of different clinical states (disease/s, risk factor/s) for a patient by using the healthcare/clinical data repository, applying different constraints (age, sexuality, profession) against the data.*

*Keywords:*

Clinical states correlation, Association mining, Healthcare

## Introduction

In the recent era, medical science has revealed that the occurrence of one disease can lead to several associated diseases and risk factors. For example, Heart-Block can lead to the occurrences of other clinical states like Hypertension, Cardiac-Arrest and so on. It is, however, still an interesting problem and thus in this research work we have developed a Clinical State Correlation Prediction (CSCP) system-prototype which helps reveal relations among different diseases and health related risk factors.

## Methods and Working Procedures

Data mining algorithms are proven to explore correlations in larger data repositories. Association rules based data mining model has been implemented in this research work. The disease/risk factor like clinical state observation system proposed here are composed of two different software applications stated as bellow.

**OLTP Application:** When a patient will visit a doctor he/she must have to fill up a prescribed form and the information from the form is then be captured through web enabled OLTP system and data will be stored into the healthcare/clinical data repository.

**CSCP Application:** This application will import transactional records from OLTP application for further processing to generate correlations among clinical states using Association Rules data mining techniques.

## Architecture, Input, Processing and Output



Figure 1 Proposed System Architecture

```
Algorithm  -  GenerateRule
PROCEDURE GenerateRule (maxpass, minsup)
   // the method requires two user input
   // maxpass- maximum number of items are consider in an itemset
   // minsup- minimum support for the candidate sets
BEGIN
   1. Produce maxpass copies of transaction data by aliasing the original
      one for generating all possible combination of items in each pass by
      producing Cartesian product and then filter the meaning sets
   2. Calculate the supports for the filtered sets
   3. Eliminate the sets having support less than minsup
END
```

*Table1 - Transactional data sample*

| Patient Id | Disease |
|---|---|
| P000000001 | Bradycardia |
| P000000001 | Cardiac Arrest |
| P000000002 | Bradycardia |
| P000000002 | Hypertension |
| … | … |

*Table 2 - Candidate Sets after 2nd pass*

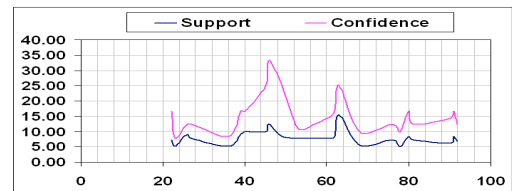| Itemset | Cnt | Supp (%) | Conf (%) |
|---|---|---|---|
| {Bradycardia, Cardiac-Arrest} | 26 | 2.60 | 8.52 |
| {Bradycardia, Heart Block} | 9 | 0.90 | 2.69 |
| ………………… | … | … | … |
| {Heart Block, Hypertension} | 10 | 1.00 | 1.82 |
| {Heart Block, Myocarditis} | 11 | 1.10 | 3.29 |



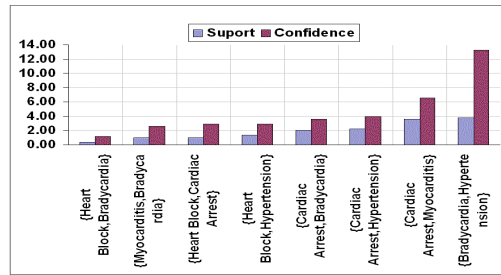*Figure 2-Support and confidence for {Hypertension, Heart-Block} at different age groups*

*Figure 3-Supports and confidences for different item sets in second pass for female*

## Conclusions

In this research work, we have succeeded to investigate correlation among different clinical states for patients of different age and gender providing the results in statistical as well as in graphical format. The recognised pattern by this implementation definitely can improve the healthcare services along with medical researchers for further exploring trends of diseases/clinical conditions that are correlated.

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