An Analysis towards the use of existing tools and techniques for identifying severe asthmatic variation - *Review Paper*

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Abstract—This paper will be an outcome of an exhaustive literature review of the clinical effectiveness of interventions using information and communication technologies (ICTs) for managing and controlling chronic diseases like Asthma. Several existing theories and practices were assessed the effectiveness of ICTs and measured some clinical indicator. Overall, ICT applications did not show an improvement in clinical outcomes, although no adverse effects were identified. However, ICTs used in the detection and follow up of pulmonary diseases provided better clinical outcomes, mortality reduction and lower health services utilization. Systems used for improving education and social support were also shown to be effective. At present the evidence about the clinical benefits of ICTs for managing chronic disease is limited.

Keywords: Asthma, ICT, Peak Flow meter, Spirometer, Wheezing

I. Introduction

Asthma and Chronic obstructive pulmonary disease (COPD) are common diseases of the airways and lungs that have a major impact on health of the population especially in countries that are highly polluted. The main method to treat this is to inhale the medication to the site of the disease origin. The diagnosis available for asthma is both physical instruments and frequent tests done at the hospital.

Asthma is a common chronic inflammatory disease of the airway characterized by variable and recurring symptoms, reversible airflow obstruction and bronchospasm Common According to the report of WHO Factsheet it reports Asthma is not just a public health problem for developed countries. In developing countries, however, the incidence of the disease varies greatly In India it has an estimated 15-20 million asthmatics. Asthma has no cure. Even if the patient feels fine, the patient still have the disease and it can flare up at any time. The today's knowledge and treatments, most people who have asthma are able to manage the disease. They can live normal, active lives and sleep through the night without interruption from asthma. If the person has asthma the patient can take an active role in managing the disease. They have a healthy and protect the health and to be healthy the patient should have ongoing treatment, build strong partnerships with the doctor and other health care providers.

Common symptoms found in Asthma are Wheezing, Coughing, Shortness of breath, Chest tightness/pain. Other nonspecific symptoms in infants or young children may be a history of recurrent bronchitis, bronchiolitis, or pneumonia; a persistent cough with colds; and/or recurrent croup or chest rattling.

The exact cause of asthma isn't known. Researchers think some genetic and environmental factors interact to cause asthma, most often early in life. These factors include An inherited tendency to develop allergies, called atopy (AT-o-pe), Parents who have asthma,Certain respiratory infections during childhood, Contact with some airborne allergens or exposure to some viral infections in infancy or in early childhood when the immune system is developing If asthma or atrophy runs in the family, exposure to irritants (for example, tobacco smoke) might make your airways more reactive to substances in the air. Some factors might be more likely to cause asthma in certain people than in others. Researchers continue to explore what causes asthma.

II. Asthmatic types

Asthma types are classified according to the cause that creates the asthmatic nature. Types listed below of asthma are according to the cause, exposure or specific symptom.

Allergic asthma- In this type of asthma, you develop asthma symptoms following repeated exposures to allergens such as Second hand smoke ,Animal dander, Dust Mites, Cockroaches and Mold

Cough variant asthma- While cough may accompany the usual symptoms associated with asthma, cough alone may be a precursor to or the sole symptom in this type of asthma. When cough is the only asthma symptom, this is known as cough variant asthma.

Occupational asthma- If the person wheezes, coughs, or feel short of breath at work? Occupational asthma is a common respiratory condition that results from exposures in the workplace. This type of asthma is characterized by airway irritation, obstruction, and inflammation caused by exposure to certain substances in the workplace. The exposure triggers symptoms from your immune system or through direct irritation of the airways.

Exercise induced asthma- This type of asthma occurs in 7% to 20% of the general population and is characterized by bronchoconstriction and asthma symptoms that develop during or following exercise.

Medication induced asthma- Despite doing everything your doctor has recommended to control your asthma, you still experience bouts of severe or worsening asthma because of medication you take for another health condition. While it's not clearly understood how this happens, doctors suspect this type of asthma is akin to an allergic reaction.

Nocturnal asthma- In this type of asthma, the amount of air they breathe, is measured as FEV1, decreases by at least 15% from bedtime to waking up in the morning. For some people, the decline in lung function can be significantly more -- and this is all associated with increased symptoms, such as cough, wheezing and shortness of breath that disrupt sleep..

III. ASTHMATIC CLASSIFICATION

Based on guidelines from NHLBI, for the ongoing asthma treatment and asthma classification can be looked at in terms of asthma control:

- Well controlled-In this asthma classification, they are generally symptom-free and without impairment. The patient has symptoms and uses the rescue inhaler two or fewer days per week. They rarely wake up at night due to the asthma and the peak flow (PEF) is greater than 80% of their best or predicted PEF.
- Not well controlled- This asthma classification is characterized by symptoms that occur several times per week and more frequent use of the rescue medication. PEF ranges from 60% to 80% and nighttime symptoms also occur more frequently.
- Very poorly controlled- In this asthma classification they have daily symptoms and rescue inhaler use. The PEF is less than 60% of predicted.

IV. ASTHMATIC DIAGNOSTIC DEVICES

Devices used to detect asthma:-According to the National Heart, Lung, and Blood Institute. January 1, 2009. Expert Panel Report 3 (EPR3), the following are recognized and standard devices used in detecting and diagnosing asthma.

Peak Flow - Peak Flow is probably the simplest test that can be used to detect the asthma and it can be an integral part of your asthma care plan. Peak flows can easily be done at home with an inexpensive device called a peak flow meter. Peak flow measure how quickly air can be blown out of the lungs.

Spirometry-Spirometry is slightly more complicated than peak flow and it is usually done in the doctor's office and it measures both how much and how quickly air moves out of the lungs. It is important in both the diagnosis and management of asthma over time.

Complete Pulmonary Function Testing - The asthma care provider may require determining the lung volumes and diffusing capacity. This is often done if the asthma diagnosis is unclear. The test requires the patient to sit inside a special box that helps to determine how much air they breathe in and out.
Lung Volumes: The body plethysmography test will determine the lung volumes. Asthma may cause certain changes in lung volumes that will assist in diagnosing or treating the asthma
Diffusion Capacity: Diffusion capacity measures how well oxygen flows from the lungs into the blood. Poor diffusion indicates damage to the lung where the oxygen and blood meet in the lungs. Diffusion capacity is usually normal in asthmatics.

Chest x-ray -Chest x-ray is a test commonly performed for patients who wheeze. An asthma care provider will usually order one to make sure there is not some other condition that may be causing the symptoms like a lung infection.Bronchoprovocation Challenge Testing - the patient will inhale a specific substance through a nebulizer, often methacholine or histamine. This is done to see if the lungs become irritated, hyperresponsive, and lead to the development of asthma symptoms. The test has a high negative predictive value. This means that if the test is negative it is unlikely the patient has asthma.
Pulse oximetry -Pulse oximetry is a non-invasive way to measure oxygenation of blood or how well oxygen is being exchanged between the lungs and the blood. A sensor is placed on the fingertip or other thin part of the body with blood vessels close to the skin. The sensor measures changes in wavelengths of light and is able to estimate an arterial blood gas -An arterial blood gas (ABG) is an arterial blood sample used to determine how well blood is oxygenated -- a marker for oxygen exchange between the lungs and the blood. Commonly, a blood sample will be obtained from one of the arteries near the wrist. This test may likely be performed during an acute asthma exacerbation and is more reliable than pulse oximetry Allergy Testing - The relationship between allergies and asthma has been known for a long time. Allergens the patient normally breathes in can increase the inflammatory reaction and hyperresponsiveness in the lungs. However, your doctor cannot reliably determine if a particular allergen is responsible for the patient symptoms on clinical grounds alone. Because of this, they may recommend allergy testing. Not all asthmatics are tested. But if they have persistent asthma, they would probably recommend testing.

V. LITERATURE REVIEW:

In Paper Titled A Knowledge-Based System for Tutoring Bronchial Asthma Diagnosis published by Badri Prasad, Hugh WoodJim Greer, Gordon McCalla in 1989[1], focused on A knowledge-based system for tutoring student physicians to diagnose bronchial asthma .The system uses a case-based instruction methodology where the student would learn how to diagnose bronchial asthma through practice on carefully selected cases.

The tutoring system presents the case to the student as the student requests information, and is able to provide help if the student needs it. The dialogue is completely controlled by the student who can use his/ her own language in conversing with the system. Embedded in the tutoring system is an expert diagnostician for bronchial asthma which is called upon to evaluate the student's attempted diagnosis and is used to provide a summary of the reasoning behind the expert's diagnosis. The system was fully implemented, and has been tested with actual physicians, and field tested with physicians and residents in internal medicine. The system prepared is robust and seems to be effective for the domain of bronchial asthma.

In this paper the authors have referred and prepared their applications to overcome these following problems in tutoring systems
Most of them are traditional tutoring systems [2,3,4], lacking a representation of the knowledge they teach ,and rigid in their interactions with the student. According to Feurzig [SI, the first attempt at incorporating a formal representation of knowledge, and conducting the tutoring dialogue in natural language seems to have been made in SOCRATES. It is a rule-based tutoring system for teaching differential diagnosis in clinical medicine. GUIDON [5] is the first ever attempt at building a tutoring system to use existing knowledge bases. It constitutes an important milestone in intelligent tutoring systems (ITS) research, postulating the need for more support knowledge in consultation systems for use in instructional settings [6].

CAI the computer aided Instructions would help the help medical students to acquire the basic factual knowledge .Most medical instruction programs **are** designed to teach cognitive skills. and a majority of them are traditional CAI systems [1,2,3,]. They lack are presentation of the knowledge they teach, and place rigid restrictions on the range of interaction they permit. The tutor described here has a representation of the knowledge it brings tobear on its functioning, and is capable of natural language dialogue with the student.

GUIDON [5] is among the few programs which take a knowledge-based approach to tutoring. It **uses** a programming methodology that separates models of teaching into general discourse procedures. It is not clear if such programs can provide the same level of performance as well-tuned traditional CAI programs [5]. Further, there are not many expert systems available which can make optimal use of what GUIDON has to offer (PUFF is one counter-example), Moreover, GUIDON needs a consultation run before a tutorial session can begin, which impairs the system's flexibility and complicates the startup of the system. Finally, the time involved in building GUIDON-like tutoring systems is large.
The tutor consists of the following components: the controller, the case bank, the domain expert, the tutoring expert and the working memory. The controller coordinates communication between the tutor and the student. The case bank is a repository of medical cases appropriately chosen for instructing the student on bronchial asthma diagnosis. The domain expert captures the physician's problem-solving expertise used to diagnose bronchial asthma. The working memory records information as the session progresses, and can be used as a student model by the tutoring expert which monitors student behaviour, and renders help in problem solution when the student seeks it. The controller manages the tutoring session, and ensures a smooth transition from case presentation to diagnosis.

Details about the System:
SYMBOLICS 3640 machine using the development system ART. The program incorporates all of the components described: the controller, the case bank, the domain expert and the tutoring expert. The controller and associated procedures were written in Lisp; the rest of the system is in ART language. The production rule formalism was chosen to represent diangostic and tutoring expertise in the tutor. This formalism provides for a modular representation of knowledge and has cognitive underpinnings. It allows for easily capturing strategic and structural knowledge in task rules. The ART expert system shell was chosen to facilitate quick prototyping of the tutor using production rule formalism. The controller and the associated procedures were written in Lisp; Lisp provided the needed string processing capabilities and predicates to complement ART'S capabilities. Once the prototype is fine tuned for robust performance, the program can be ported to smaller machines.
Method Followed to analyze the system:
Each resident was asked to diagnose two cases on the system **and** fill out a questionnaire; the time involved was roughly seventy five minutes for each resident. The residents were asked to use a 5-point scale to grade their responses (ranging from very good (5) to poor (l)) The objective of the system is to produce practical and working tutors; a pragmatic approach is to build tutors for narrow and specific domains, exploiting the nature of the domain to the fullest. The tutor described here does precisely this for the domain of bronchial asthma diagnosis. The approach involves in corporating the problem-solving knowledge and the tutoring knowledge of an expert medical teacher into one system. By carefully studying the tutoring needs of the domain, identifying the tutoring expertise necessary, and incorporating the expertise needed to build a working system, one can hope to build a tutor for this domain in a normal design cycle. Furthermore, the task of building a user interface is considerably simplified by the limited vocabulary of the domain. The concern in tutoring is handling student misconceptions. Bronchial asthma is quite often an exclusion diagnosis (i.e. bronchial asthma is all that is left after other alternatives have been rejected), and the knowledge brought to bear upon the diagnostic process is shallow. Hence, misconceptions based on wrong associations are quite common.

In the Paper Titled Web Based Monitoring of Asthma Severity :A new Approach to Ambulatory Management published by Joseph Finke1stein.Manuel R. Cabrera, George Hripcsak in the year 1998[7] The authors have developed a Web-based system for ambulatory monitoring of pulmonary function and tested it in a home setting in 14 asthma patients. The system uses a portable spirometer for patient self-testing and a palmtop computer that transmits the results from patients' homes to a hospital information system via phone or wireless network. The results are immediately available to physicians on a Web site accessible via an Internet Web browser from any location. The system provides daily monitoring of 29 indices of Forced Vital Capacity test (FVC), the flow-volume loop and symptom scores. It generates alerts based on changes in data trends and exchanges messages between patients and physicians. All patients successfully uploaded their FVC data including the flow volume loop and symptom scores from their homes to our central repository. The flow volume loop and FVC parameters provided a more accurate assessment of the patient's asthma, and uncovered previously unrecognized nocturnal asthma and small airway obstruction. They believed on this approach it was useful for asthma management on a day-to-day basis and in clinical research.

System Specification and functioning of the system:

The computing devices used in the system are a pocket-sized palmtop HP200LX (Hewlet Packard) and Mininote PS-3000 (Prolinear). Both palmtops run MS-DOS compatible software and have slots for network interface. They work with batteries or with an AC adapter. Cable wires are adapted to connect the spirometer to the palmtops via serial port. A standard portable spirometer (VitalographV2120brand). This device was compact hand-held device that measures and stores flow-volume loop and 29 spirometry indices and is capable of transmitting results via a serial port to a computer. The average transmission time from the patient's palmtop to the central computer was about 1 minute for the 14.4 Kbps landline modem, 6 minutes for the cellular digital network and 8 minutes for the RAM Mobile network.

Literatures referred for developing the system:

PEF accuracy may depend on the brand of flowmeter and is very effort dependent with significant intrapatient variability [8]. PEF values are really a reflection of large airway caliber and of expiration muscle strength [9]. Studies have documented persistent airway obstruction in asymptomatic children and adults with asthma with normal peak flows [10,11]. These same studies concluded that spirometry tests provide the most reliable assessment of airway dysfunction. PEF does not assess peripheral airway obstruction and cannot substitute for a complete forced vital capacity (FVC) test that includes a flow volume loop and measurements of forced vital capacity and late forced expiratory flows [10,12].Another common is advantage of most peak flow monitoring methods, especially when used in clinical studies, is the total dependence on the patient's ability and reliability to document measurements on a diary card [13]. Poor compliance with PEF has been well documented in the literature [14.15]. Additionally, the delay in the communication or availability of PEF to the physician limits the potential value of self-monitoring in disease management. Even the most advanced systems that allow patients to send measurements via telephone to a central station provide delayed weekly or monthly printout via mail or fax [13].

Model of the System:

The patients use a portable spirometer and a computing device for self-testing at home on a regular basis. They enter symptom scores according to the questions displayed on the computing device. They are then prompted to perform a fill forced vital capacity test using the spirometer, which is connected to the computing device and automatically downloads the spirometry results to the computing device. Upon completion of the self-testing maneuver, all results are immediately transmitted by the computing device to the remote server of a centralized information system. The centralized information system can be a hospital information system, any other remote institution, or a computer of an individual physician. The server checks the validity of data, generates messages to both patient and physician, and stores the data in a central repository. The data is available for review from any computer location using a Web browser. The spirometer is used to perform the FVC test and to transmit the results to the computing device.

The system provides an elaborate and efficient flow of data and information between patient and health care provider. This technology allows daily serial monitoring of FVC from the patient's home, work or any remote site with landline or cellular phone access.

The system provides a backbone for real-time decision support in the management of asthma on a day-today basis. Web-based access to results of asthma severity monitoring combined with automatic alert mechanism may help physicians to respond to changes in a timely manner and avert asthma morbidity and mortality.

In Paper Titled Home Asthma Telemonitoring (HAT) Systempublished by J.Finkelstein, R.H.Friedman in 2000[16]

The Home Asthma Telemonitoring (HAT) system was designed to address problems in asthma self-care management described above. HAT filly implements NAEPP guidelines and uses current state-of-the-art knowledge about the educational, behavioural, cognitive and organizational components of asthma self management.

It is designed to minimize the burden of asthma monitoring both for patients and physicians and to simplify program implementation in present-day ambulatory care delivery. The HAT system aims to provide patients with continuous individualized help in the daily routine of asthma self-care, coupled with an ongoing communication link with their health care providers. It is designed to detect and to provide help to asthma patients who have difficulties in following their self-care plans, and to notify health care providers if certain clinical conditions occur to enable timely intervention.

The HAT system provides automatic decision support for monitoring and analyzing all information traffic between the patient and the system in real-time mode. The decision support is directed at ensuring patient compliance with the self-testing protocol, the validity of self-testing and for interpreting changes in patient data, and is performed by a combination of the patient's palmtop and the remote clinical server. The palmtop performs an initial validity check of the lung function test and the consistency of the asthma diary data. Further analysis is performed by the remote server. Each time the HAT server receives new data, it retrieves previous results and analyzes all data to check whether predefined conditions are met (which are specific for each patient and are consistent with that patient's action plan). The system also periodically checks patient's compliance with self-testing. If predefined conditions are met, the system automatically sends an alert to medical personnel and/or the patient.

HAT Evaluation Studies

An evaluation study of the HAT system [17] showed that (1) lung function test results collected during home asthma tele monitoring are comparable to those collected under the supervision of trained professionals, and (2)Internet-based home asthma tele monitoring can be successfully implemented in a group of patients without previous computer experience. The clinical impact of HAT on asthma outcomes and patient compliance is being currently evaluated in a randomized clinical trial.The HAT System was designed to monitor asthma patients and to help them in day-to-day management of their disease. HAT has a potential for improving clinical outcomes and quality of life in this patient population and may be a model for monitoring and self-management of patients with other chronic health conditions.

In Paper Titled Compliance with and accuracy of daily self-assessment of peak expiratory flows published by P. Verschelden, A. Cartier, J. L'Archevêque, C. Trudeau, J-L. Malo1996[18]

In this paper peak expiratory flow (PEF) assessment has been proposed in the clinical evaluation of asthma. In subjects attending the asthma clinic of a tertiary care hospital, the authors wanted to assess: 1) compliance in performing PEF; and 2) accuracy of a PEF-diary.

Twenty adult asthmatic subjects, all using inhaled steroids, were asked to assess their PEF in the morning and evening with a VMX instrument (Clement Clarke Int., Colombus, OH, USA). This instrument, which incorporates a standard mini- Wright peak flow meter, stores PEF data on a computer chip. Subjects were not informed that the values were being stored. The mean duration of PEF monitoring was 89 days (range 44–131 days). For the total of 20 subjects, it was estimated that 3,482 values should have been written down and stored on the VMX computer chip. Whilst 1,897 values (54%) were written down, only 1,533 (44%) were stored, 425 values being invented. Morning and evening values were stored on 34% of days; and values were stored at least once a day on 55% of days. The values written down corresponded precisely to stored values 90% of the time, and were within ±20 L 94% of the time. They conclude that: 1) compliance with daily peak expiratory flow assessments is generally poor in chronic stable asthmatic subjects assessed on two visits separated by a 3 month period; and 2) a substantial percentage of values (22%) is invented.

The authors summarize, and have showed that compliance with peak expiratory flow monitoring is often unsatisfactory in asthmatic subjects using inhaled steroids who are asked to record their values for a 3 month period in order to provide information to the physician on the severity of asthma. In this situation, a substantial number of values were invented and it is unlikely that peak expiratory flow monitoring would represent a satisfactory means for monitoring asthma on a chronic basis, such as in clinical or drug trials. Compliance with peak expiratory flow monitoring would also need to be assessed in other circumstances:1) as used in an action plan; 2) on an as needed basis, i.e. only if subjects feel their symptoms increase; and 3) in more severe and brittle asthmatics.

In Paper Titled Compliance with inhaled medication and self-treatment guidelines following a self-management programme in adult asthmatics published by . Van der Palen J, Klein JJ, Rovers MM: 1997 [19] The aim of the study was to objectively monitor treatment compliance as part of self-treatment behaviour in a self-management programme in adult asthmatics. Various studies have evaluated compliance with inhaled medication in different ways; results of these studies depend partly upon the way in which compliance ismeasured. Notably, self-reported compliance and, to alesser extent, pill-counts and weighing of canisters, tendto overestimate use of medication .To overcome these problems, all inhaled steroids were administered *via* an electronic inhalation device (Nebulizer Chronolog (NC); Medtrac, Lakewood, CO 80215, USA; and Electronic Diskhaler (ED)). In this way, over estimation of medication use could be avoided. PEF was also registered with an electronic peak flow meter (DiaryCard ;SensorMedics Corp., Yorba Linda, CA, USA). Because patients were recommended to use the electronic peakflow meter on a fixed day of the week and when they experienced an increase in symptoms, the system could partially monitor compliance with the self-treatment guidelines, by combining the inhaler and peak flow data In Paper Titled Assessment of accuracy and applicability of a portable electronic diary card spirometer for asthma treatment published by . Godschalk I, Brackel HJL, Peters JCK,Bogaards in 1996[20] The device specification of the peak flow meter is the pocked-sized electronic peak flow meter and asthma monitor (weight 145 g, length 112 mm) contains a fixed turbine that is driven by the exhaled air of the patient. The rotational flow of the turbine is converted by optical scanning of half revolutions into PEF, FEV1 and FVC. The data are displayed digitally on a liquid crystal screen, with the best blow within 10 min being stored in the memory .This study demonstrated that the measurement of PEF,FEV1 and FVC by the electronic asthma monitor AM1satisfied the criteria for monitoring devices set by the American Thoracic Society[ATS], including the criteria for inter- and intra device variability. Several studies have validated PEF monitoring devices [21, 22, 23], including one electronic device which showed acceptable performance for the measurement ofFEV1 [24]. In the present study, ATS criteria for testing the AM1 device were applied, as these standards were available at the time of the study and ATS wave forms cover a broad range of relevant flow patterns. In order to achieve as strict as possible an evaluation, the complete set of testing criteria were checked. The variety of flow profiles includes those with fast rise times, which are suitable for testing the frequency response of the device, particularly in view of the fact that a peak flow meter is primarily designed to be used in subjects with normal or deteriorated lung function. Therefore, a potential distortion at extremely high flow rates is probably not relevant. The mechanical test rig used in the study generated known accurate flow rates with adequate power to yield the required acceleration, even for higher flow rates.

VI. ANALYSIS METHODS

Decision Supports Systems (DSS) are computer-based information systems designed in such a way that help managers to select one of the many alternative solutions to a problem. A logical and systematic decision-making process helps you address the critical elements that result in a good decision. By taking an organized approach, you're less likely to miss important factors, and you can build on the approach to make your decisions better and better. The Literature review explained above are analysed using a Decision Support process with the following key elements below:

Uncertainty – Manual entries could lead to incorrect results. This should also cover inability to have daily doctor visits.

Complexity – You have to consider many interrelated factors.

High-risk consequences – The impact of the decision may be significant. High Impact on the calculated results.

Alternatives – Each has its own set of uncertainties and consequences. Regular doctor visits are mandatory to conclude any results.

Interpersonal issues – It can be difficult to predict how other people will react. No realtime data sets / people. It is very difficult to analyze actual status.

Based on the above key criteria, a comparison was done on the above published work.

Table 1. Review of Published and accredited techniques for Identifying and Analysing Asthma

Type / Category	Badri, Hugh et al.	Joseph Finkelstein;Manuel R. Cabrera; George Hripcsak	J.Finkelstein, R.H.Friedman	P. Verschelden, A. Cartier, J. L'Archevêque, C. Trudeau, J-L. Malo	J. van der Palen, J.J. Klein, M.M. Rovers	K. Richter, F. Kanniess, B. Mark, R.A. Jörres, H. Magnussen
Deviced based	Yes	Yes	Yes	Yes	Yes	Yes
Device Name	Questionnare	Spirometry	Peak Flow Meter	Peak Flow meter	Digital Peak Flow Meter	Digital Peak Flow Meter
Identification Method	With Symptoms based on answers	Forced Vital Capacity Test,Spirometry 29 indices	Questionnare	Self	Self	Self
Automatic / Manual	Manual	Automatic	Manual	Automatic	Automatic	Automatic
Tutorial / Analysis Based	Tutorial	Analysis	Analysis	Analysis	Analysis	Analysis
Symptoms	Patients Case History is used	asthma symptoms on a 0-3 scale (0 = none, 1 = mild, 2 = moderate, 3 = severe)	PEF-based action plans	Asthmatic Patients	Asthmatic Patients	Asthmatic Patients
Patient Type: -Asthmatic -Lung Transplants -COPD	Bronchatic Asthmatic	Asthmatic	Asthmatic	Asthmatic	Asthmantic	Asthmantic
Reference Values / Data Sets	Personalized	Personalized	Personalized	Personalized	Personalized	Personalized
Number of Subjects	Case banks are created with symptoms	14	Not mentioned	20	22	49
Period of Study	Not mentioned	Used by Patients for one month.	Values are stored for four months for the review of the doctors	Three Months	Six Weeks	Four Weeks
Results -Accurate -Nearly Accurate -In accurate	Nearly accurate	Accurate	Nearly Accurate	Accurate	Accurate	Accurate
Final Results (Rating)	03/05	03/05	03/05	03/05	04/05	04/05

VII. CONCLUSION

Based on the above analysis methodology, it is very clear that the papers written by J. van der Palen, J.J. Klein, M.M. Rovers and K. Richter, F. Kanniess, B. Mark, R.A. Jörres, H. Magnussen have got a better decision making subsystem inside the implementation design which is also proven to be tested on an automatic mode on real time data sets. The weightage provided in Table 1 is based on the evaluation of the decision set parameters explained above and the weightage proves that the above two research implementation stands out to be the best of all the five literature elements reviewed in this paper.

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