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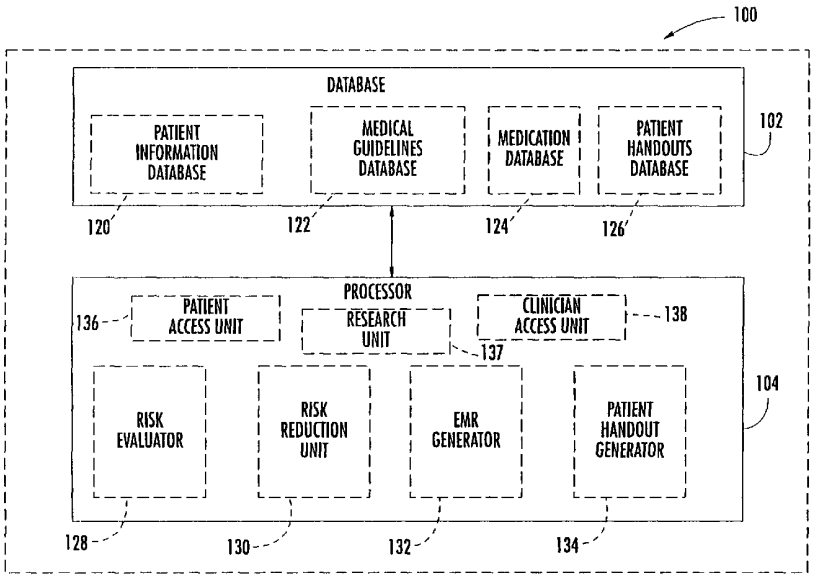
(54) Title: PATIENT ANALYSIS AND RISK REDUCTION SYSTEM AND ASSOCIATED METHODS INCLUDING THE USE OF PATIENT MONITORED DATA



(57) Abstract: The patient analysis and risk reduction system is used on a global network, and includes a guideline database for storing a plurality of different medical guidelines for different health conditions, such as cardiovascular disease, and a patient information database. A risk evaluator evaluates patient information and generates a risk report based upon at least one of the different medical guidelines, and a risk reduction unit generates a physician's patient treatment plan based upon the different medical guidelines. Patient-specific instructions and educational material are also generated. Furthermore, a patient access unit permits patient monitored information to be entered by a patient while a clinician access unit permits patient reported information and clinician recorded information to be entered by a clinician via the global network.

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PATIENT ANALYSIS AND RISK REDUCTION SYSTEM AND ASSOCIATED METHODS INCLUDING THE USE OF PATIENT MONITORED DATA

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Related Applications

This application is based upon and claims priority from copending provisional application Serial No. 60/229,266 filed August 30, 2000, the disclosure of which is incoporated by reference herein in its entirety.

Field of the Invention

The present invention relates to health care, and, more particularly, to computerized medical systems and methods for providing patient risk assessment and/or medical diagnosis using patient information and medical guidelines.

Background of the Invention

Diagnostic systems, otherwise known as "expert systems" attempt to determine a cause as being the

production of a plurality of events. Computer based diagnostic/expert systems are commonplace today and are applied to diagnosing problems in many different areas. For example, such systems are utilized to diagnose diseases, to locate geological formations, and to manage complex systems such as nuclear power plants, communications networks, etc. In medical terminology, a diagnostic/expert system attempts to determine the identity of a disease as being the production of two or more contemporaneous symptoms.

Expert systems are built around a knowledge base of specific information and an inference or rules engine. When an expert system is presented with a problem to solve, the rules engine combines information in the knowledge base with information about the problem. The rules engine applies its particular methodology to derive conclusions on the basis of the information provided. In such a system the knowledge base is made up of a set of condition/action rules in the form "if...then" or "yes...no". A problem is presented to the system in the form of a set of true propositions (e.g. information obtained from the user). The system searches for rules which could satisfy a hypothesis and scans current conditions to determine whether the rule can be applied.

Disease management systems are expert systems that use a particular rules engine and knowledge base to automate the diagnosis and/or treatment of a specific disease or condition. For example, U.S. Publication No. 2001/0012913A1 to Iliff and entitled "Disease Management System and Method Including Correlation Assessment" is directed to a system and method for providing patient access to a an automated system for managing a specific health problem.

However, the system attempts to take the practice of medicine out of the hands of physicians and put it into the hands of patients.

Another example of a medical expert system is U.S. Patent No. 6,188,988 to Barry et al. and entitled "Systems, Methods and Computer Program Products for Guiding the Selection of Therapeutic Treatment Regimens." This system is primarily concerned with guiding the user to select therapeutic regimens for a known disease such as HIV infection. This system is not concerned with determining and reducing a patient's risk relating to a certain health condition.

Also, the number of accepted and standardized medical practice guidelines for different health conditions relating to a certain condition, such as cardiovascular disease, are increasingly becoming difficult for the physician to manage and assimilate. Being capable of efficiently managing these guidelines while analyzing patient information to identify and reduce patient risk would reduce the cost of health care such as hospital stays and follow up care.

Summary of the Invention

In view of the foregoing background, it is therefore an object of the invention to provide a system and method for efficiently and accurately managing a plurality of medical guidelines while analyzing patient information to identify and reduce patient risk for a specific health condition.

This and other objects, features and advantages in accordance with the present invention are provided by a patient analysis and risk reduction system for use on a global network, such as the Internet. The system includes a guideline database

for storing a plurality of different medical guidelines for different health conditions, such as cardiovascular disease, and a patient information database. Also, a processing device is associated with the database for receiving patient information from a user via the global network, and includes a risk evaluator for evaluating the patient information and generating a risk report based upon at least one of the different medical guidelines, and a risk reduction unit for evaluating the patient data and generating a physician's patient treatment plan including patient-specific recommendations for reducing risk based upon the different medical guidelines.

A patient handout generator generates patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report and the physician's patient treatment plan. Furthermore, a patient access unit permits patient monitored information to be entered by a patient using a first remote computer via the global network and stored in the patient information database, and a clinician access unit permits patient reported information and clinician recorded information to be entered by a clinician using a second remote computer via the global network and stored in the patient information database. The patient access unit may also provide access to the patient-specific instructions and educational material, which may be guidelines for hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management. The patient monitored information preferably includes blood pressure data and blood sugar data, and the

patient reported information and clinician recorded information preferably comprises gender, age, body mass index (BMI), cholesterol, blood pressure, blood sugar, allergies, diseases, family disease history, symptoms, lifestyle information, and current medications. The processing device further may also comprise an electronic medical record (EMR) generator for generating a patient EMR based upon the patient information, the risk report and the physician's patient treatment plan.

The different medical guidelines may comprise medical guidelines for hypertension, diabetes, cholesterol, obesity and coronary disease, and the physician's patient treatment plan may include links or references to the different medical guidelines used by the risk reduction unit.

Objects, features and advantages in accordance with the present invention are also provided by a method for analyzing and reducing patient risk using a global network and including storing a plurality of different medical guidelines for different health conditions in a database, collecting patient information from a user via the global network, and evaluating the patient information and generating a risk report based upon at least one of the different medical guidelines. Also, the method includes evaluating the patient data and generating a physician's patient treatment plan including patient-specific recommendations for reducing risk based upon the different medical guidelines, generating patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report and the physician's patient treatment plan, storing patient monitored information, entered by a

patient using a first remote computer via the global network, in a patient information database, and storing patient reported information and clinician recorded information, entered by a clinician using a second remote computer via the global network, in the patient information database. Permitting access to the patient-specific instructions and educational material by the patient using the first remote computer via the global network may also be provided.

Brief Description of the Drawings

FIG. 1 is a schematic diagram of the system of the present invention connected to a global computer network.

FIG. 2 is a schematic diagram illustrating the details of the system of the present invention.

FIG. 3 illustrates a user interface for collecting patient information used by the system of FIG. 2.

FIGs. 4A-4C are flow charts illustrating an example of the risk evaluation performed by the system of FIG. 2.

FIG. 5 illustrates an example of a risk report generated by the system of FIG. 2.

FIG. 6 is a schematic diagram illustrating the details of an embodiment of the risk reduction unit of the system of FIG. 2.

FIGs. 7A and 7B are flow charts illustrating an example of the analysis performed by the risk reduction unit of FIG. 6.

FIGs. 8A and 8B illustrate an example of a physician's treatment plan generated by the risk reduction unit of FIG. 6.

Detailed Description of the Preferred Embodiments

The present invention will now be described more fully hereinafter with reference to the

accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

As will be appreciated by those skilled in the art, the present invention may be embodied as a method, data processing system, or computer program product. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment, or an embodiment combining software and hardware aspects. Furthermore, the present invention may be a computer program product on a computer-usable storage medium having computer readable program code on the medium. Any suitable computer readable medium may be utilized including, but not limited to, static and dynamic storage devices, hard disks, optical storage devices, and magnetic storage devices.

The present invention is described below with reference to flowchart illustrations of methods, systems, and computer program products according to an embodiment of the invention. It will be understood that each block of the flowchart illustrations, and combinations of blocks in the flowchart illustrations, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute

via the processor of the computer or other programmable data processing apparatus, implement the functions specified in the flowchart block or blocks.

These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory result in an article of manufacture including instructions which implement the function specified in the flowchart block or blocks. The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions specified in the flowchart block or blocks.

Referring to FIGs. 1 and 2, a patient analysis and risk reduction system **100** for use on a global network **106** will now be described. The global network may be an intranet, local area network (LAN) or wide area network (WAN), for example. However, for the present invention, the global network **106** is preferably the Internet, and the system **100** is preferably implemented as an Application Service Provider (ASP) model utilizing the functionality of the Internet. As such, the system **100** provides a comprehensive disease management methodology delivered to a physician/clinician's office **108** through the ASP. Accordingly, there is no need to install on-site software and all that is necessary to

access the system **100** from the clinician remote computer terminal is a web browser and an internet connection, as would be appreciated by the skilled artisan.

A database **102** at least stores a plurality of different medical guidelines for different health conditions, such as cardiovascular disease. The medical guidelines are based upon accepted and standardized national or international medical guidelines published by experts in a particular area of medicine, such as medical guidelines for hypertension, diabetes, cholesterol, obesity and coronary disease. For example, the medical guidelines for hypertension are set forth in the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC6) convened by the National Institute of Health and published in the Archives of Internal Medicine, Volume 157, page 2413-2446, 1997.

Other examples of medical guidelines include, and are not limited to:

The Executive Summary of the Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults, published by the Expert Panel on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults, convened by the National Institute of Health and published in the Archives of Internal Medicine, Volume 158, page 1855-1867, 1998;

The Smoking Cessation Clinical Practice Guideline, Number 18, published by the Agency for Health Care Policy and Research, April 1996, publication number 96-0692;

The Second Report from the Expert Panel on the Detection, Evaluation and Treatment of High Blood

Cholesterol in Adults by the National Cholesterol Education Program, published by NIH in the U.S. Dept. of Health and Human Services, NIH publication number 93-3095, September 1993;

The 27th Bethesda Conference, Matching the Intensity of Risk Factor Management with Hazards of Coronary Disease, published in the Journal of American College of Cardiology, Volume 27, pages 957-1047, April 1996, endorsed by the American College of Cardiology and the American Heart Association;

The Consensus Panel Statement, Preventing Heart Attack Deaths in Patients with Coronary Artery Disease, published by the American Heart Association, Volume 92, pages 2-4, 1995;

"A Global Measure of Perceived Stress," Cohen and Karmarck, Journal of Health and Social Behavior, Volume 24, pages 385-396, 1983;

Standards of Medical Care for Patients with Diabetes Mellitus, published by the American Diabetes Association in Diabetes Care, Volume 21, Supplement One, January 1998, pages F23-F31; and

Diabetes Medical Practice Guidelines by the State of Florida Agency for Health Care Administration in consultation with the Diabetes Practice Guideline Advisory Committee, published by the state of Florida, January 1998.

The database **102** may include a patient information database **120** for storing patient data, a medical guidelines database **122** for storing the medical guidelines, a medication database **124** for storing information on medication including details, options, indications and contraindications, and a patient handout database **126** for storing educational material including guidelines for exercise, diet and

lifestyle changes. The patient information database **120**, medical guidelines database **122**, medication database **124**, and patient handout database **126** are illustrated as separate blocks of the database **102** for ease of understanding; however, it is understood that the information may be combined and accessed via associated data addresses as would be readily apparent to those skilled in the art. Furthermore, the patient information database **120** may be a research database for storing historical patient information data for a plurality of patients.

A processor **104** collects patient information from a user via the global network **106**. As discussed, the user is typically a clinician using a remote computer terminal **108** connected to the system **100** via the Internet. The processor **104** includes a risk evaluator **128** for evaluating the patient information and generating a risk report **129** (FIG. 5) based upon at least one of the different medical guidelines, as will be discussed in greater detail below. Also, a risk reduction unit **130** is for evaluating the patient information and generating a physician's patient treatment plan **131** (FIGs. 8A and 8B) as will also be discussed in greater detail below. Such a treatment plan **131** includes patient-specific recommendations for reducing risk based upon the different medical guidelines.

A patient handout generator **134** generates patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report **129** and the physician's patient treatment plan **131**. The patient handout generator **134** uses the information stored in the patient

handout database **126**. An electronic medical record (EMR) generator **132** may be provided for generating a patient EMR based upon the patient information, the risk report **129** and the physician's patient treatment plan **131**. EMR's are known in the art and require no further description herein. Of course, other records, such as progress notes, may be generated for the patient's chart or file.

A research unit **137** provides access to an authorized user of the system **100** via a remote computer terminal **108**, and correlates historical patient information data and patient compliance with the physician's patient treatment plan **131** to generate outcome-specific research data. The outcome-specific research data may be used in clinical studies to evaluate and update the medical guidelines, for example. The outcome-specific research data may include health trends, and the risk reduction unit **130** may generate the physician's patient treatment plan **131** based upon the health trends.

Furthermore, a patient access unit **136** permits patient monitored information to be entered by an authorized patient using a remote computer terminal **110** with a secure connection to the system **100** via the global network **106**. The patient monitored information is stored in the patient information database **120** and preferably includes daily blood pressure and blood sugar levels monitored at home by the patient. A clinician access unit **138** permits patient reported information and clinician recorded information to be entered by an authorized clinician using a remote computer terminal **108** with a secure connection to the system **100** via the global network

106. The patient reported information and clinician recorded information may be stored in the patient information database **120**, and preferably comprises gender, age, body mass index (BMI), cholesterol, blood pressure, blood sugar, allergies, diseases, family disease history, symptoms, lifestyle information, and current medications.

The patient access unit **136** may also provide access to the patient-specific instructions and educational material, which may be guidelines for hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management.

Referring to FIG. 3, an example of a user interface **139** accessible via a web browser on one of the computer terminals **108/110** is shown. The data fields for blood pressure and blood sugar may be updatable by both the authorized clinician and authorized patient while the other data fields may only be updated by the authorized clinician. After the patient information is entered, the risk evaluator **128** may operate to perform a risk evaluation, e.g. the risk of cardiovascular disease, for the patient. Referring to FIGs. 4A-4C, a flow chart illustrating an example of the risk evaluation for cardiovascular disease is shown. The risk evaluation includes yes/no/goto logic as would be appreciated by the skilled artisan.

The risk evaluator **128** may then generate the patient risk report **129** as shown, for example, in FIG. 5. As can be seen from the risk report **129**, risk points are assessed for various values of health indicators, such as age, cholesterol, blood pressure etc. Then an overall percent of risk of having a

heart attack over the next 10 years is calculated. Such a risk report may be analyzed by the physician, printed for the patient and/or printed for the patient chart.

If the risk report **129** indicates a risk of disease which the physician believes is a concern for the patient's health, a treatment plan may be generated by the risk reduction unit **130**. Of course, the system may also operate to automatically generate the treatment plan by the risk reduction unit **130** if any risk is indicated in the risk report **129** or by the risk evaluator **128**. Referring to FIG. 6, the risk reduction unit **130** may include various analysis modules **140-158** which refer to and may be based upon the medical guidelines stored in the database **102** as discussed above. These analysis modules **140-158** correspond to different health conditions relating to the disease for which the patient is at risk. In this example, the disease is cardiovascular disease and the analysis modules include, but are not limited to, diabetes analysis **140**, obesity analysis **142**, lipid analysis **144**, lipid combination analysis **146**, hypertension analysis **148**, stress reduction analysis **150**, secondary prevention analysis **152**, angina analysis **154**, congestive heart disease analysis **156** and atrial fibrillation analysis **158**.

Also, the risk reduction unit **130** may include a user customizable evaluation module **160** for evaluating the patient data and generating customized patient-specific recommendations for reducing risk. For example, if a particular physician wanted to vary his treatment plan for patients with specific conditions, the customizable evaluation module **160**

may implement that physician's variations for one or more of the medical guidelines.

An example of the operation of an analysis module is illustrated in the flow chart of FIGs. 7A-7B. Specifically, an example of the stress reduction analysis module **150** which may be based upon and/or refers to "A Global Measure of Perceived Stress," Cohen and Karmarck, Journal of Health and Social Behavior, Volume 24, pages 385-396, 1983, is shown. Of course the other analysis modules **140-158** may be similarly implemented with yes/no or if/then rules which evaluate the patient information.

Referring now to FIGs. 8A and 8B, a physician's patient treatment plan **131** may be generated by the risk reduction unit **130** after the patient information has been evaluated. Such a treatment plan **131** preferably includes at least some of the patient information collected by the processor **104**, medical guideline recommendations, information for the physician, medication information, followup recommendations, patient instructions and/or links to patient handouts. The patient handout list may include links to digital versions or hard copies of the handouts which are generated by the patient handout generator **134**.

The patient information database **120** may store the patient information, the risk report **129** and the physician's patient treatment plan **131**. In such a case, the processor **104** may monitor the patient information over time and update the risk report **129** and the physician's patient treatment plan **131** accordingly.

The patient handout generator **134** may also generate disease-specific educational material. The

patient-specific instructions and educational material may include guidelines for hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management as discussed above. The physician's patient treatment plan **131** may include active links and/or references to the different medical guidelines used by the risk reduction unit. The physician's patient treatment plan **131** may include medication details and options including contraindications.

A method aspect of the invention includes a method for analyzing patients and reducing risk using a global network **106** and including storing a plurality of different medical guidelines for different health conditions, collecting patient information from a user via the global network, and evaluating the patient information and generating a risk report **129** based upon at least one of the different medical guidelines. Also, the method includes evaluating the patient information and generating a physician's patient treatment plan **131** including patient-specific recommendations for reducing risk based upon the different medical guidelines, and generating patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report 129 and the physician's patient treatment plan 131.

Furthermore, the method may include storing historical patient information data for a plurality of patients in the patient information database or research database **120**, and correlating historical patient information data and patient compliance with the physician's patient treatment plan **131** to

generate outcome-specific research data, such as health trends. Subsequently generated patient treatment plans **131** may also be based upon the health trends.

Also, the method may include storing patient monitored information, entered by a patient using a first remote computer **110** via the global network **106**, in a patient information database **120**, and storing patient reported information and clinician recorded information, entered by a clinician using a second remote computer **108** via the global network, in the patient information database. Permitting access to the patient-specific instructions and educational material by the patient using the first remote computer **110** via the global network **106** may also be provided.

A patient electronic medical record (EMR) based upon the patient information, the risk report and the physician's patient treatment plan is also preferably generated. Moreover, the method may include monitoring the patient information over time and updating the risk report **129** and the physician's patient treatment plan **131** based upon updated patient information.

In sum, the invention is preferably embodied as a core software application that operates from a remote personal computer **108** connected to a global network **106**, such as the Internet, and supports physicians by giving them immediate access to a wide and deep range of pertinent data and information at the point of care. The application, run by an underlying rules engine application that enables convergence of data, takes seemingly disparate patient data and hunts for risk associated with, for

example, cardiovascular disease. The system is capable of bringing order, standardization and consistency to a wide range of healthcare businesses responsible for disease management and cost containment, and is ideal for physicians and their extenders working in busy practices in clinical, hospital and community-based settings. Accessing the web-enabled application on a standard PC desktop during the patient visit, the physician or physician extender begins building an electronic medical record (EMR) for each patient. The program keeps track of pertinent patient information, such as lab values, family history, patient demographics, drug therapy, and the details of the physician-patient encounter.

Through the collection of this data, the system can then measure patient outcomes, track patient compliance, document the encounter, and include information on specific patient education materials given to the patient. Later, the physician can query the database for specific data such as blood pressure variations, pertinent patient history, and so forth. The system also measures outcomes so that the physician can better track the progress of a patient following a certain protocol to determine whether the treatment is effective.

The system and method facilitates standardization or "reproducibility" of the treatment planning process with options for personalization. The treatment plan produced by the application is comprehensive, containing patient-specific recommendations for medical care and follow-up. In addition, it incorporates patient education materials addressing dietary and exercise recommendations, important medication-related instructions and other information that facilitates self-care and

compliance. Copies of the resulting documents may be placed in the patient's medical record, thereby enhancing physician documentation of the patient encounter.

The invention harnesses technology to streamline and optimize disease detection and management processes while ensuring that the power to oversee and individualize patient care stays in the hands of the doctor. The application goes beyond traditional management of disease by incorporating both prevention and detection with a strong emphasis on early risk identification. This system and method was designed with doctors and their extenders in mind.

Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is understood that the invention is not to be limited to the specific embodiments disclosed, and that modifications and embodiments are intended to be included within the scope of the appended claims.

THAT WHICH IS CLAIMED IS:

1. A cardiovascular analysis and risk reduction system for use on a global network comprising:

a guideline database for storing a plurality of different medical guidelines for different health conditions relating to cardiovascular disease;

a patient information database;

a processing device associated with the databases for receiving patient information from a user via the global network, the processing device comprising

a risk evaluating unit for evaluating the patient information and generating a cardiovascular risk report based upon at least one of the different medical guidelines,

a risk reduction unit for evaluating the patient data and generating a physician's patient treatment plan including patient-specific recommendations for reducing cardiovascular risk based upon the different medical guidelines,

a patient handout generating unit for generating patient-specific instructions and educational material including guidelines for at least one of exercise, diet and lifestyle changes based upon the patient information, the cardiovascular risk report and the physician's patient treatment plan,

a patient access unit for permitting patient monitored information to be entered by a patient using a first remote computer via the global network and stored in the patient information database, and

a clinician access unit for permitting patient reported information and clinician recorded information to be entered by a clinician using a second remote computer via the global network and stored in the patient information database.

2. A cardiovascular analysis system according to Claim 1 wherein the patient access unit provides access to the patient-specific instructions and educational material.

3. A cardiovascular analysis system according to Claim 2 wherein the patient-specific instructions and educational material includes guidelines for at least one of hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management.

4. A cardiovascular analysis system according to Claim 1 wherein the patient monitored information comprises at least one of blood pressure data and blood sugar data.

5. A cardiovascular analysis system according to Claim 1 wherein the patient reported information and clinician recorded information comprises at least one of gender, age, body mass index (BMI), cholesterol, blood pressure, blood sugar, allergies, diseases, family disease history, symptoms, lifestyle information, and current medications.

6. A cardiovascular analysis system according to Claim 1 wherein the processing device further comprises an electronic medical record (EMR) generator for generating a patient EMR based upon the patient information, the cardiovascular risk report and the physician's patient treatment plan.

7. A cardiovascular analysis system according to Claim 1 wherein the different medical guidelines

comprise medical guidelines for hypertension, diabetes, cholesterol, obesity and coronary disease.

8. A cardiovascular analysis system according to Claim 1 wherein the physician's patient treatment plan includes links to the different medical guidelines used by the risk reduction unit.

9. A cardiovascular analysis system according to Claim 1 wherein the physician's patient treatment plan includes references to the different medical guidelines used by the risk reduction unit.

10. A patient analysis and risk reduction system for use on a global network comprising:

a guideline database for storing a plurality of different medical guidelines for different health conditions;

a patient information database;

a processing device associated with the databases for receiving patient information from a user via the global network, the processing device comprising

a risk evaluating unit for evaluating the patient information and generating a risk report based upon at least one of the different medical guidelines,

a risk reduction unit for evaluating the patient data and generating a physician's patient treatment plan including patient-specific recommendations for reducing risk based upon the different medical guidelines,

a patient handout generating unit for generating patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report and the physician's patient treatment plan,

a patient access unit for permitting patient monitored information to be entered by a patient using a first remote computer via the global network and stored in the patient information database, and

a clinician access unit for permitting patient reported information and clinician recorded information to be entered by a clinician using a second remote computer via the global network and stored in the patient information database.

11. A system according to Claim 10 wherein the patient access unit provides access to the patient-specific instructions and educational material.

12. A system according to Claim 11 wherein the patient-specific instructions and educational material includes guidelines for at least one of hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management.

13. A system according to Claim 10 wherein the patient monitored information comprises at least one of blood pressure data and blood sugar data.

14. A system according to Claim 10 wherein the patient reported information and clinician recorded information comprises at least one of gender, age, body mass index (BMI), cholesterol, blood pressure, blood sugar, allergies, diseases, family disease history, symptoms, lifestyle information, and current medications.

15. A system according to Claim 10 wherein the processing device further comprises an electronic medical record (EMR) generating unit for generating a patient EMR based upon the patient information, the

risk report and the physician's patient treatment plan.

16. A system according to Claim 10 wherein the different medical guidelines comprise medical guidelines for hypertension, diabetes, cholesterol, obesity and coronary disease.

17. A system according to Claim 10 wherein the physician's patient treatment plan includes links to the different medical guidelines used by the risk reduction unit.

18. A system according to Claim 10 wherein the physician's patient treatment plan includes references to the different medical guidelines used by the risk reduction unit.

19. A method for analyzing and reducing patient risk using a global network comprising:

storing a plurality of different medical guidelines for different health conditions in a database;

collecting patient information from a user via the global network;

evaluating the patient information and generating a risk report based upon at least one of the different medical guidelines;

evaluating the patient data and generating a physician's patient treatment plan including patient-specific recommendations for reducing risk based upon the different medical guidelines;

generating patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report and the physician's patient treatment plan;

storing patient monitored information, entered by a patient using a first remote computer via the

global network, in a patient information database; and

storing patient reported information and clinician recorded information, entered by a clinician using a second remote computer via the global network, in the patient information database.

20. A method according to Claim 19 further comprising permitting access to the patient-specific instructions and educational material by the patient using the first remote computer via the global network.

21. A method according to Claim 20 wherein the patient-specific instructions and educational material comprise guidelines for at least one of hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management.

22. A method according to Claim 19 wherein the patient monitored information comprises at least one of blood pressure data and blood sugar data.

23. A method according to Claim 19 wherein the patient reported information and clinician recorded information comprises at least one of gender, age, body mass index (BMI), cholesterol, blood pressure, blood sugar, allergies, diseases, family disease history, symptoms, lifestyle information, and current medications.

24. A method according to Claim 19 further comprising generating a patient electronic medical record (EMR) based upon the patient information, the risk report and the physician's patient treatment plan.

25. A method according to Claim 19 wherein the different medical guidelines comprise medical

guidelines for hypertension, diabetes, cholesterol, obesity and coronary disease.

26. A method according to Claim 19 wherein the physician's patient treatment plan includes links to the different medical guidelines used by the risk reduction unit.

27. A method according to Claim 19 wherein the physician's patient treatment plan includes references to the different medical guidelines used by the risk reduction unit.

28. A method according to Claim 19 wherein the different health conditions are cardiovascular related conditions, and the risk is cardiovascular disease.

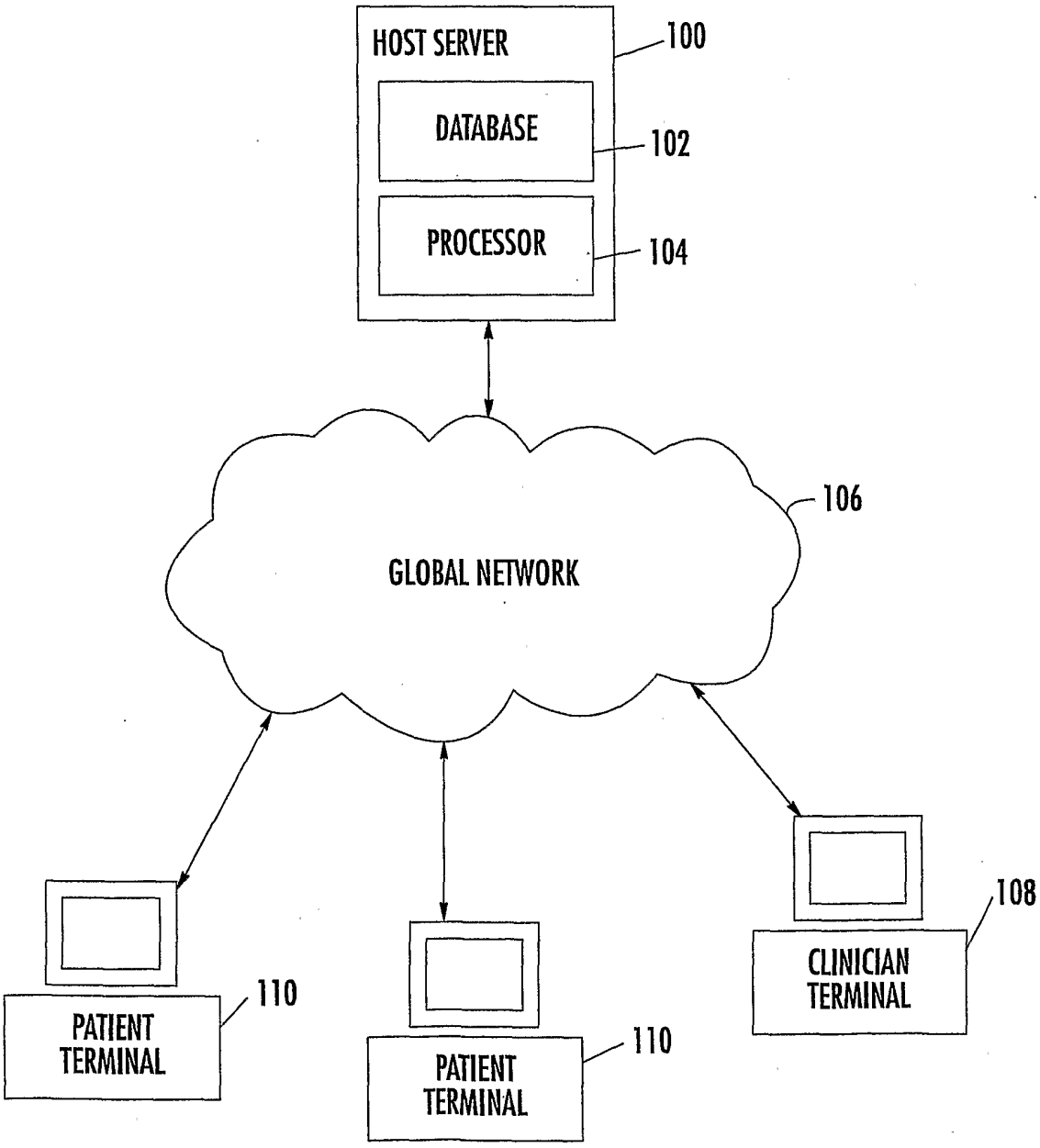
HOST SERVER
100
DATABASE
102
PROCESSOR
104
GLOBAL NETWORK
106
PATIENT TERMINAL
110
PATIENT TERMINAL
110
CLINICIAN TERMINAL
108

FIG. 1.

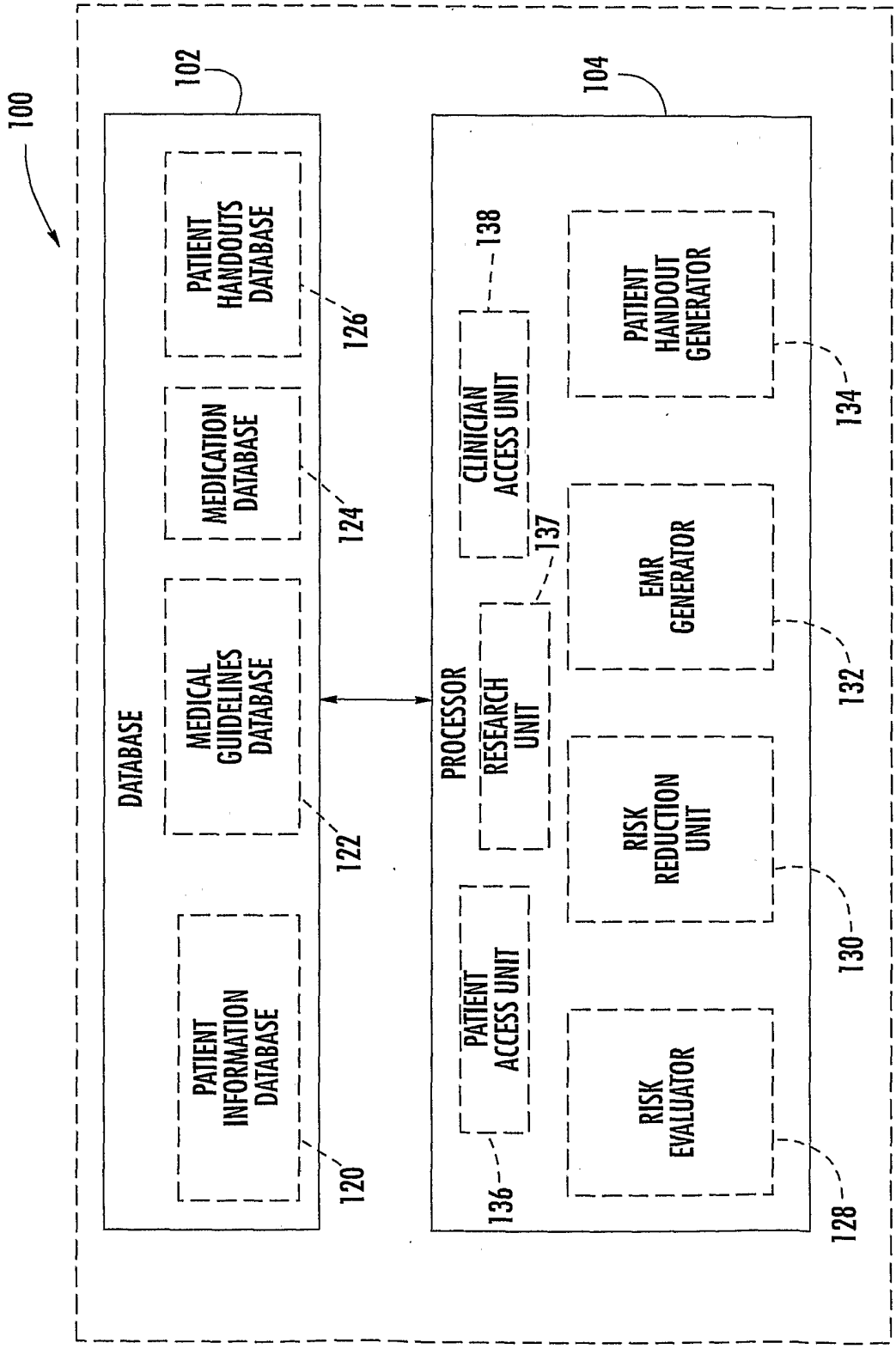
100
102
DATABASE
PATIENT INFORMATION DATABASE
MEDICAL GUIDELINES DATABASE
MEDICATION DATABASE
PATIENT HANDOUTS DATABASE
120
122
124
126
104
PROCESSOR
PATIENT ACCESS UNIT
RESEARCH UNIT
CLINICIAN ACCESS UNIT
RISK EVALUATOR
RISK REDUCTION UNIT
EMR GENERATOR
PATIENT HANDOUT GENERATOR
136
137
138
128
130
132
134

FIG. 2.

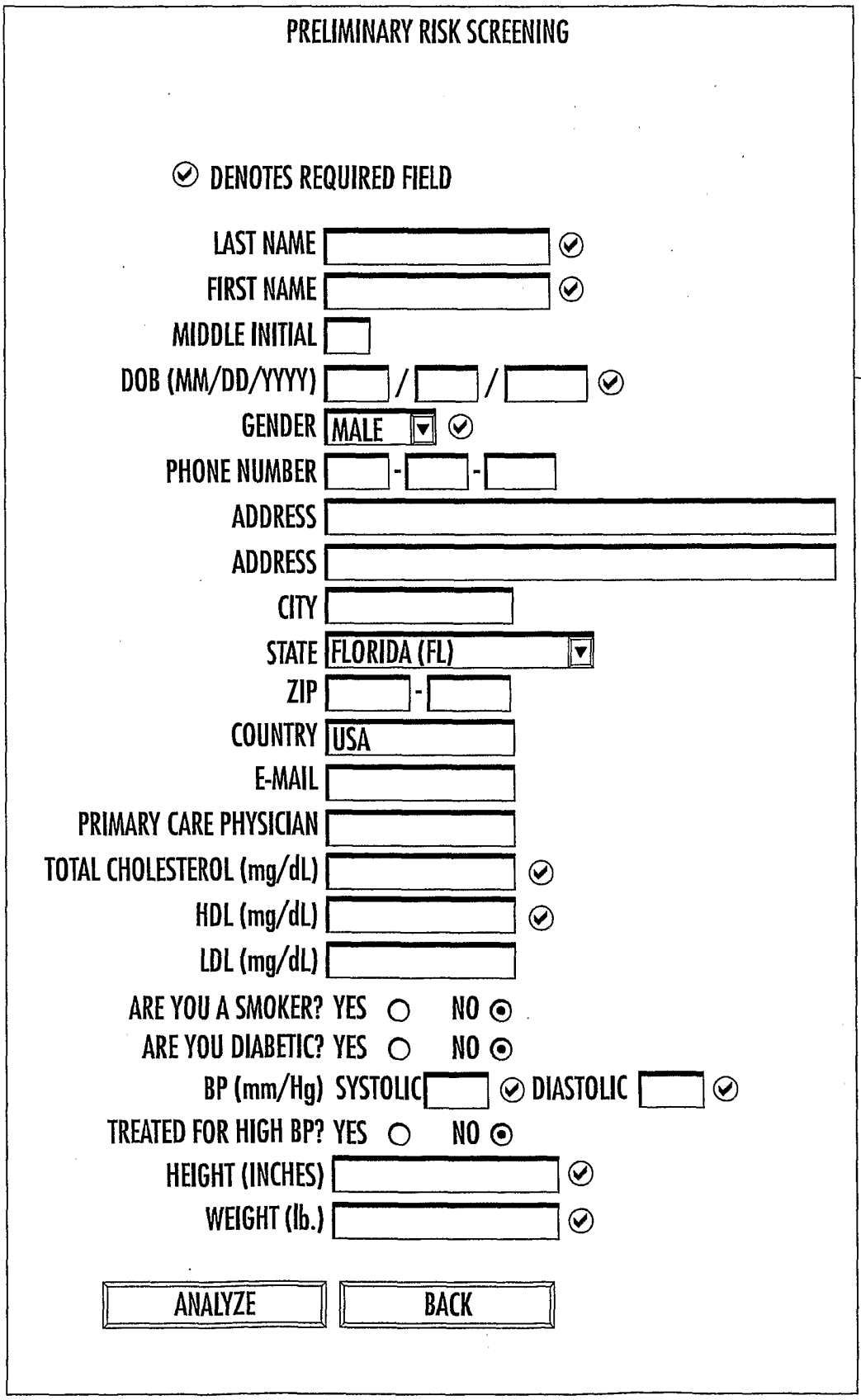
PRELIMINARY RISK SCREENING
DENOTES REQUIRED FIELD
LAST NAME
FIRST NAME
MIDDLE INITIAL
DOB (MM/DD/YYYY)
GENDER
MALE
PHONE NUMBER
ADDRESS
ADDRESS
CITY
STATE
FLORIDA (FL)
ZIP
COUNTRY
USA
E-MAIL
PRIMARY CARE PHYSICIAN
TOTAL CHOLESTEROL (mg/dL)
HDL (mg/dL)
LDL (mg/dL)
ARE YOU A SMOKER? YES NO
ARE YOU DIABETIC? YES NO
BP (mm/Hg) SYSTOLIC DIASTOLIC
TREATED FOR HIGH BP? YES NO
HEIGHT (INCHES)
WEIGHT (lb.)
ANALYZE
BACK
139

FIG. 3.

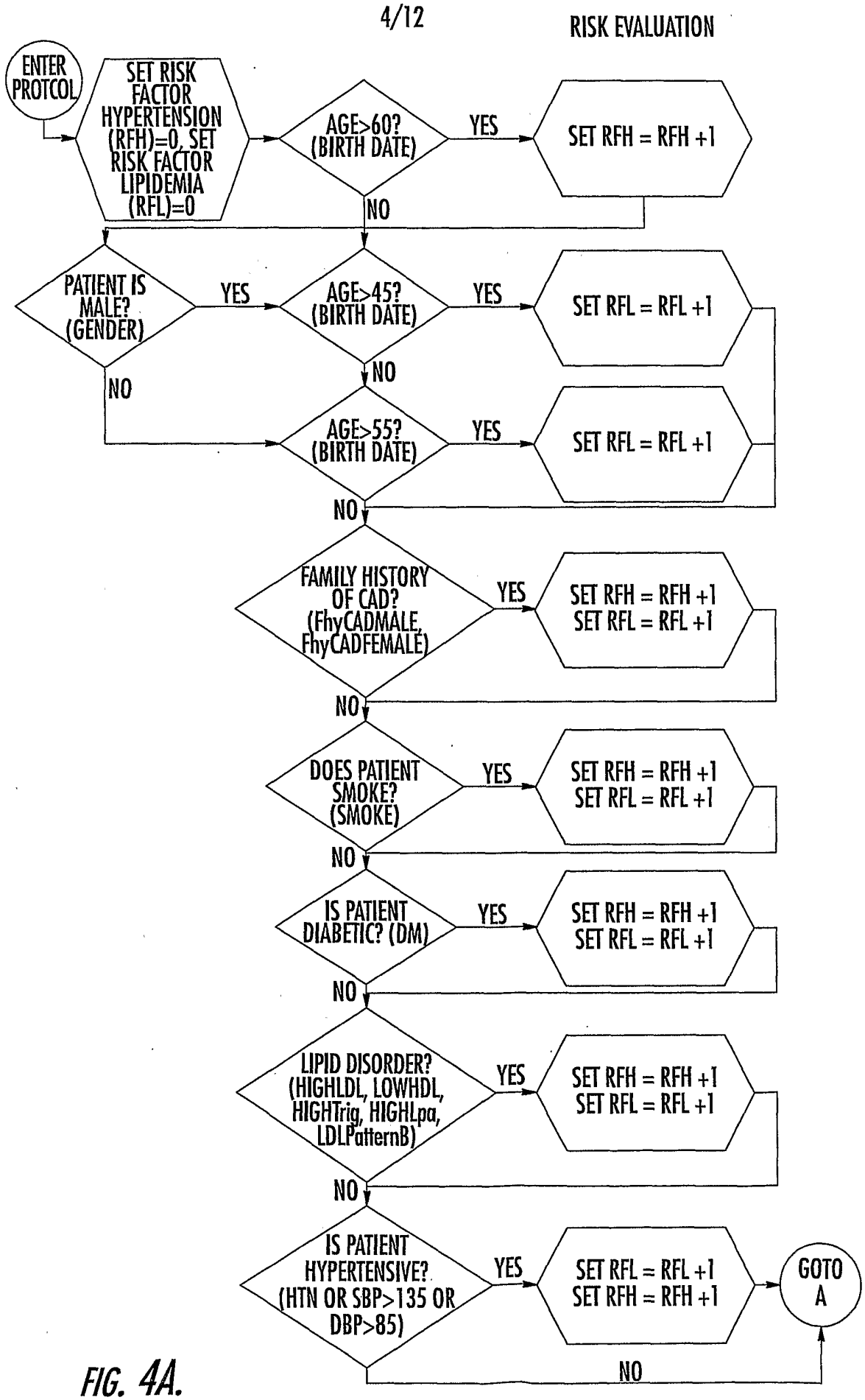
RISK EVALUATION
ENTER PROTCOL
SET RISK FACTOR HYPERTENSION (RFH)=0, SET RISK FACTOR LIPIDEMIA (RFL)=0
AGE>60? (BIRTH DATE)
YES
SET RFH = RFH +1
NO
PATIENT IS MALE? (GENDER)
YES
AGE>45? (BIRTH DATE)
YES
SET RFL = RFL +1
NO
NO
AGE>55? (BIRTH DATE)
YES
SET RFL = RFL +1
NO
FAMILY HISTORY OF CAD? (FhyCADMALE, FhyCADFEMALE)
YES
SET RFH = RFH +1
SET RFL = RFL +1
NO
DOES PATIENT SMOKE? (SMOKE)
YES
SET RFH = RFH +1
SET RFL = RFL +1
NO
IS PATIENT DIABETIC? (DM)
YES
SET RFH = RFH +1
SET RFL = RFL +1
NO
LIPID DISORDER? (HIGHLDL, LOWHDL, HIGHTrig, HIGHLpa, LDLPatternB)
YES
SET RFH = RFH +1
SET RFL = RFL +1
NO
IS PATIENT HYPERTENSIVE? (HTN OR SBP>135 OR DBP>85)
YES
SET RFL = RFL +1
SET RFH = RFH +1
GOTO A
NO

FIG. 4A.

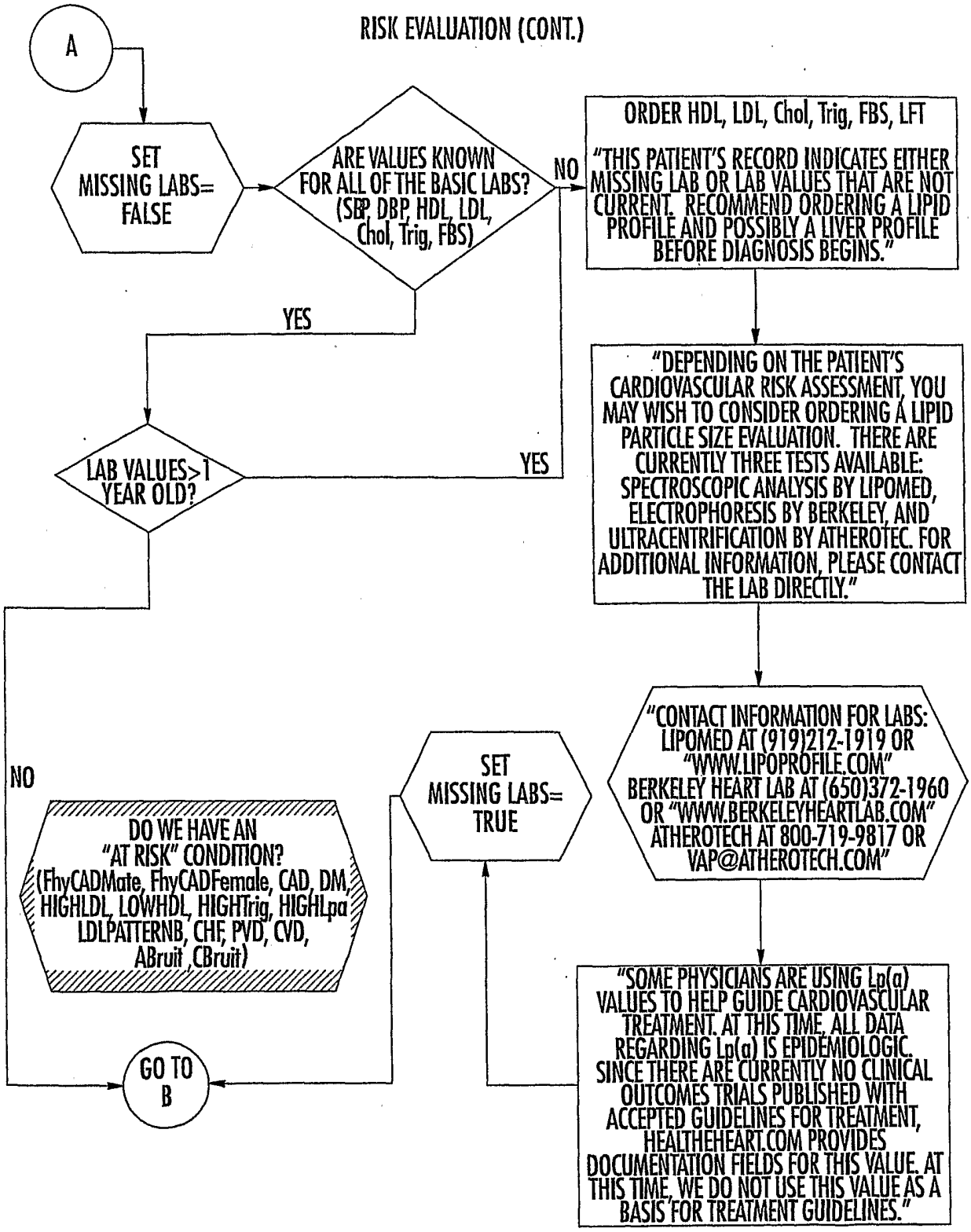
RISK EVALUATION (CONT.)
A
SET MISSING LABS= FALSE
ARE VALUES KNOWN FOR ALL OF THE BASIC LABS? (SBP, DBP, HDL, LDL, Chol, Trig, FBS)
NO
ORDER HDL, LDL, Chol, Trig, FBS, LFT
"THIS PATIENT'S RECORD INDICATES EITHER MISSING LAB OR LAB VALUES THAT ARE NOT CURRENT. RECOMMEND ORDERING A LIPID PROFILE AND POSSIBLY A LIVER PROFILE BEFORE DIAGNOSIS BEGINS."
YES
"DEPENDING ON THE PATIENT'S CARDIOVASCULAR RISK ASSESSMENT, YOU MAY WISH TO CONSIDER ORDERING A LIPID PARTICLE SIZE EVALUATION. THERE ARE CURRENTLY THREE TESTS AVAILABLE: SPECTROSCOPIC ANALYSIS BY LIPOMED, ELECTROPHORESIS BY BERKELEY, AND ULTRACENTRIFICATION BY ATHEROTEC. FOR ADDITIONAL INFORMATION, PLEASE CONTACT THE LAB DIRECTLY."
LAB VALUES>1 YEAR OLD?
YES
NO
"CONTACT INFORMATION FOR LABS: LIPOMED AT (919)212-1919 OR "WWW.LIPOPROFILE.COM" BERKELEY HEART LAB AT (650)372-1960 OR "WWW.BERKELEYHEARTLAB.COM" ATHEROTECH AT 800-719-9817 OR VAP@ATHEROTECH.COM"
SET MISSING LABS= TRUE
DO WE HAVE AN "AT RISK" CONDITION? (FhyCADMale, FhyCADFemale, CAD, DM, HIGHLDL, LOWHDL, HIGHTrig, HIGHLpa LDLPATTERNB, CHF, PVD, CVD, ABruit, CBruit)
"SOME PHYSICIANS ARE USING Lp(a) VALUES TO HELP GUIDE CARDIOVASCULAR TREATMENT. AT THIS TIME, ALL DATA REGARDING Lp(a) IS EPIDEMIOLOGIC. SINCE THERE ARE CURRENTLY NO CLINICAL OUTCOMES TRIALS PUBLISHED WITH ACCEPTED GUIDELINES FOR TREATMENT, HEALTHEHEART.COM PROVIDES DOCUMENTATION FIELDS FOR THIS VALUE. AT THIS TIME, WE DO NOT USE THIS VALUE AS A BASIS FOR TREATMENT GUIDELINES."
GO TO B

FIG. 4B.

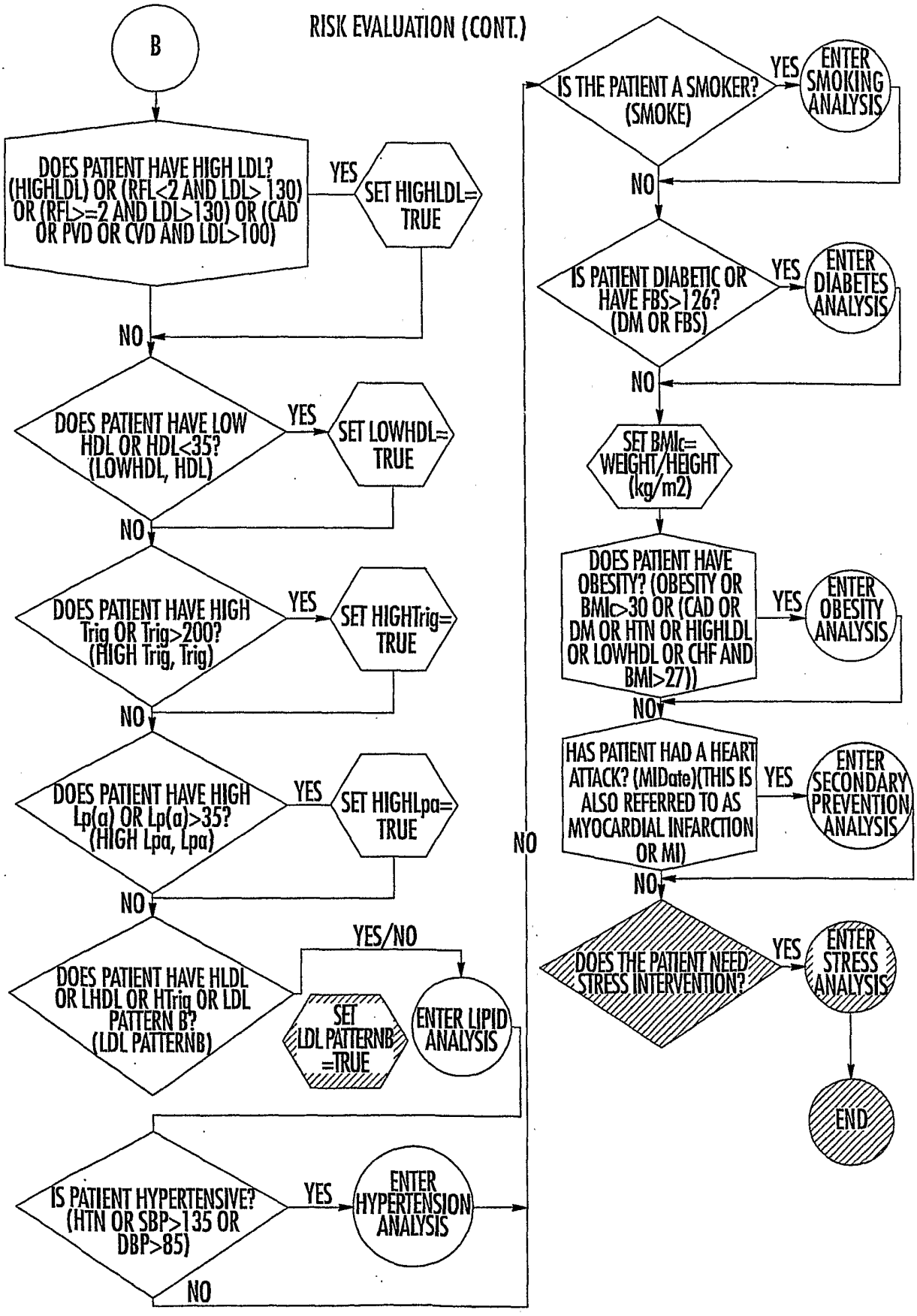
RISK EVALUATION (CONT.)
B
DOES PATIENT HAVE HIGH LDL? (HIGHLDL) OR (RFL<2 AND LDL> 130) OR (RFL>=2 AND LDL>130) OR (CAD OR PVD OR CVD AND LDL>100)
YES
SET HIGHLDL= TRUE
NO
DOES PATIENT HAVE LOW HDL OR HDL<35? (LOWHDL, HDL)
YES
SET LOWHDL= TRUE
NO
DOES PATIENT HAVE HIGH Trig OR Trig>200? (HIGH Trig, Trig)
YES
SET HIGHTrig= TRUE
NO
DOES PATIENT HAVE HIGH Lp(a) OR Lp(a)>35? (HIGH Lpa, Lpa)
YES
SET HIGHLpa= TRUE
NO
DOES PATIENT HAVE HLDL OR LHDL OR HTrig OR LDL PATTERN B? (LDL PATTERNB)
YES/NO
SET LDL PATTERNB =TRUE
ENTER LIPID ANALYSIS
IS PATIENT HYPERTENSIVE? (HTN OR SBP>135 OR DBP>85)
YES
ENTER HYPERTENSION ANALYSIS
NO
IS THE PATIENT A SMOKER? (SMOKE)
YES
ENTER SMOKING ANALYSIS
NO
IS PATIENT DIABETIC OR HAVE FBS>126? (DM OR FBS)
YES
ENTER DIABETES ANALYSIS
NO
SET BMIc= WEIGHT/HEIGHT (kg/m2)
DOES PATIENT HAVE OBESITY? (OBESITY OR BMIc>30 OR (CAD OR DM OR HTN OR HIGHLDL OR LOWHDL OR CHF AND BMI>27))
YES
ENTER OBESITY ANALYSIS
NO
HAS PATIENT HAD A HEART ATTACK? (MIDate)(THIS IS ALSO REFERRED TO AS MYOCARDIAL INFARCTION OR MI)
YES
ENTER SECONDARY PREVENTION ANALYSIS
NO
DOES THE PATIENT NEED STRESS INTERVENTION?
YES
ENTER STRESS ANALYSIS
END
NO

FIG. 4C.

RISK REPORT

CALCULATED FOR: GERARD McGANN

AGE: 47 SEX: MALE DATE: AUGUST 15, 0000

PRIMARY CARE MD:

129

BASED ON YOUR PERSONAL HEALTH INDICATORS, YOUR PHYSICIAN HAS COMPUTED YOUR RISK LEVELS FOR HEART ATTACK BASED ON THE LATEST INFORMATION FROM THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION PROVIDED BY THE HEALTHEHEART COMPUTERIZED ASSESSMENT SERVICE.

10 YEAR CORONARY HEART DISEASE RISK ASSESMENT

HEALTH INDICATOR	VALUE	RISK POINTS
PATIENT AGE	47	3
TOTAL CHOLESTEROL, mg/dL	245	6
HDL CHOLESTEROL, mg/dL (PROTECTIVE CHOLESTEROL)	32	2
SYSTOLIC BLOOD PRESSURE, mm Hg	160	2
SMOKING	Y	5
TOTAL RISK POINTS		18
PERCENT OF RISK FOR HEART ATTACK (OVER THE NEXT 10 YEARS)		30%

REDUCTION OF RISK POINTS BY TWO ADDITIONAL POINTS WOULD REDUCE YOUR 10 YEAR RISK OF HEART ATTACK TO 25%

THE BMI OF THE PATIENT IS 41.20

RISK GOAL: 3

FIG. 5.

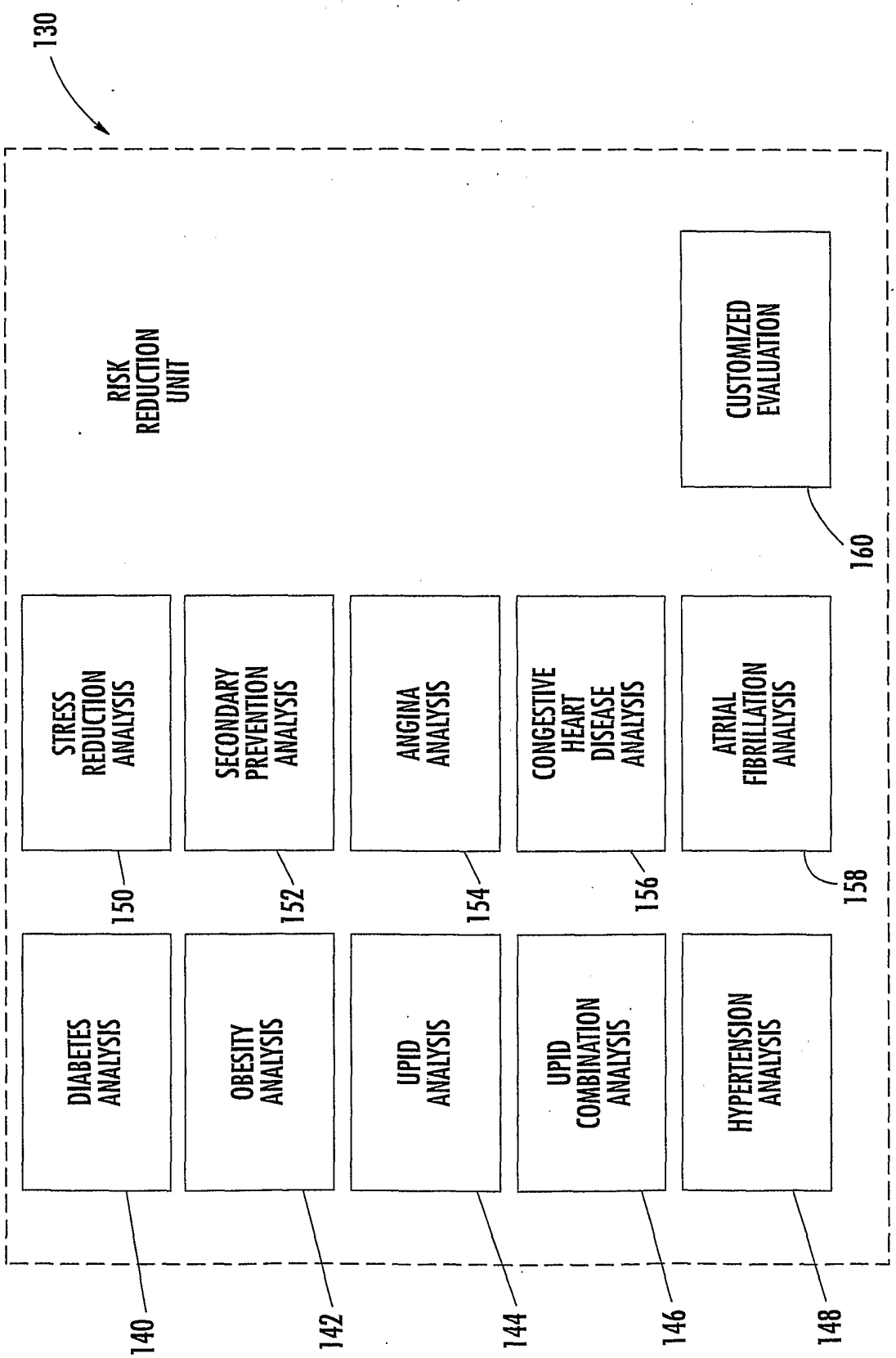
130
RISK REDUCTION UNIT
CUSTOMIZED EVALUATION
160
STRESS REDUCTION ANALYSIS
SECONDARY PREVENTION ANALYSIS
ANGINA ANALYSIS
CONGESTIVE HEART DISEASE ANALYSIS
ATRIAL FIBRILLATION ANALYSIS
150
152
154
156
158
DIABETES ANALYSIS
OBESITY ANALYSIS
UPID ANALYSIS
UPID COMBINATION ANALYSIS
HYPERTENSION ANALYSIS
140
142
144
146
148

FIG. 6.

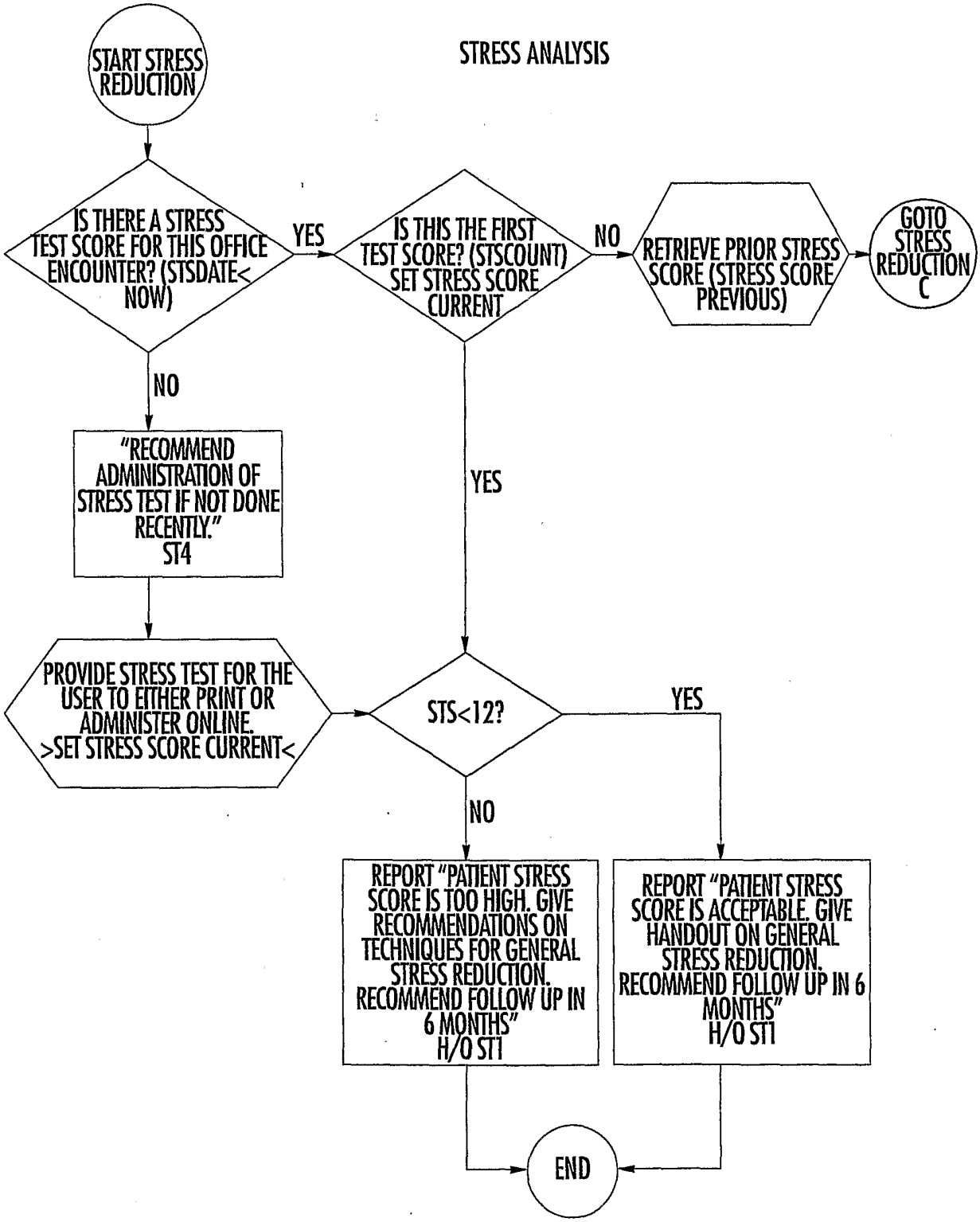
STRESS ANALYSIS
START STRESS REDUCTION
IS THERE A STRESS TEST SCORE FOR THIS OFFICE ENCOUNTER? (STSDATE< NOW)
YES
IS THIS THE FIRST TEST SCORE? (STSCOUNT) SET STRESS SCORE CURRENT
NO
RETRIEVE PRIOR STRESS SCORE (STRESS SCORE PREVIOUS)
GOTO STRESS REDUCTION C
NO
"RECOMMEND ADMINISTRATION OF STRESS TEST IF NOT DONE RECENTLY." ST4
YES
PROVIDE STRESS TEST FOR THE USER TO EITHER PRINT OR ADMINISTER ONLINE. >SET STRESS SCORE CURRENT<
STS<12?
YES
NO
REPORT "PATIENT STRESS SCORE IS TOO HIGH. GIVE RECOMMENDATIONS ON TECHNIQUES FOR GENERAL STRESS REDUCTION. RECOMMEND FOLLOW UP IN 6 MONTHS" H/O ST1
REPORT "PATIENT STRESS SCORE IS ACCEPTABLE. GIVE HANDOUT ON GENERAL STRESS REDUCTION. RECOMMEND FOLLOW UP IN 6 MONTHS" H/O ST1
END

FIG. 7A.

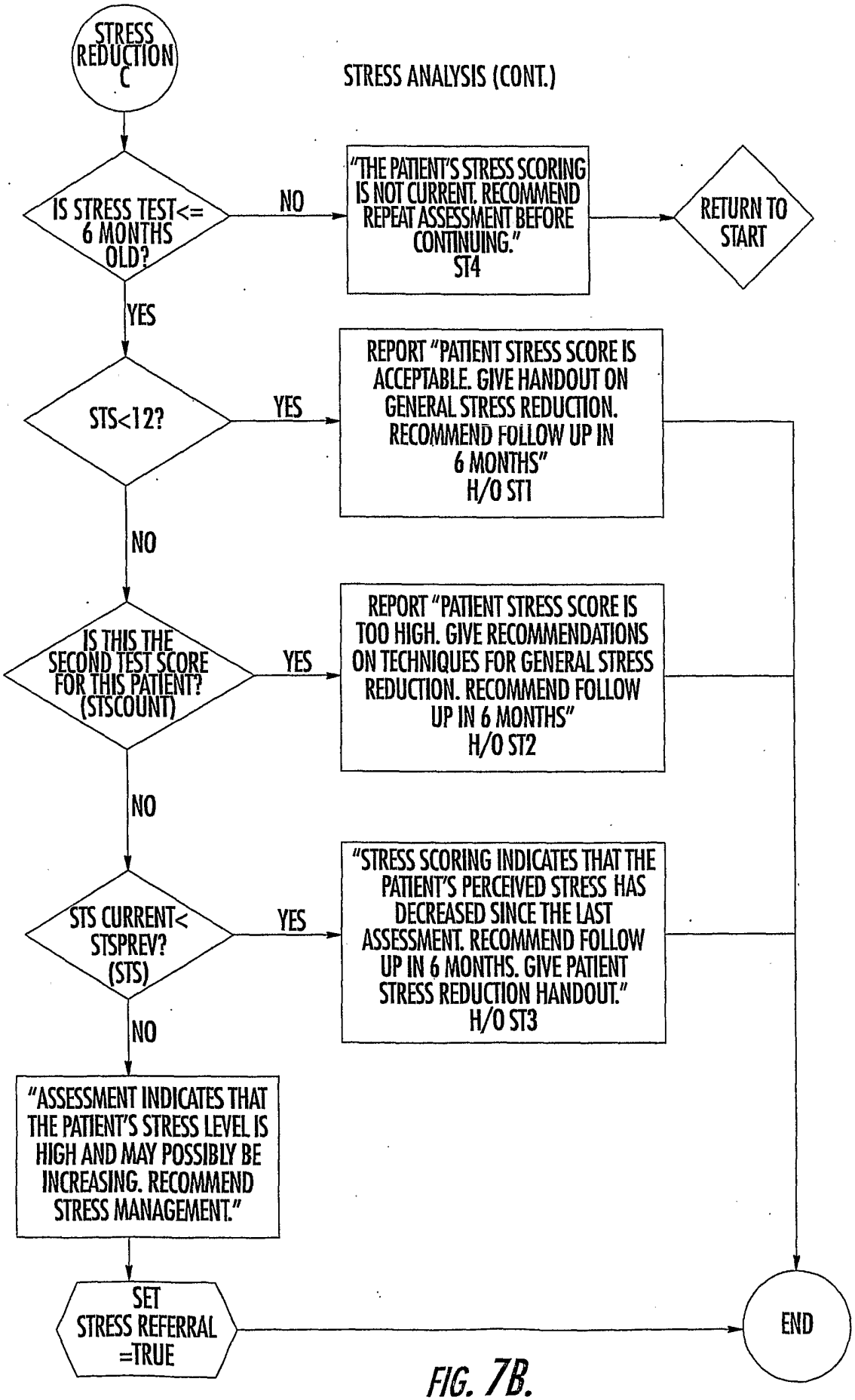
STRESS REDUCTION C
STRESS ANALYSIS (CONT.)
IS STRESS TEST<= 6 MONTHS OLD?
NO
"THE PATIENT'S STRESS SCORING IS NOT CURRENT. RECOMMEND REPEAT ASSESSMENT BEFORE CONTINUING." ST4
RETURN TO START
YES
STS<12?
YES
REPORT "PATIENT STRESS SCORE IS ACCEPTABLE. GIVE HANDOUT ON GENERAL STRESS REDUCTION. RECOMMEND FOLLOW UP IN 6 MONTHS" H/O ST1
NO
IS THIS THE SECOND TEST SCORE FOR THIS PATIENT? (STSCOUNT)
YES
REPORT "PATIENT STRESS SCORE IS TOO HIGH. GIVE RECOMMENDATIONS ON TECHNIQUES FOR GENERAL STRESS REDUCTION. RECOMMEND FOLLOW UP IN 6 MONTHS" H/O ST2
NO
STS CURRENT< STSPREV? (STS)
YES
"STRESS SCORING INDICATES THAT THE PATIENT'S PERCEIVED STRESS HAS DECREASED SINCE THE LAST ASSESSMENT. RECOMMEND FOLLOW UP IN 6 MONTHS. GIVE PATIENT STRESS REDUCTION HANDOUT." H/O ST3
NO
"ASSESSMENT INDICATES THAT THE PATIENT'S STRESS LEVEL IS HIGH AND MAY POSSIBLY BE INCREASING. RECOMMEND STRESS MANAGEMENT."
SET STRESS REFERRAL =TRUE
END

FIG. 7B.

131

>PATIENT INFORMATION

DOE JOHN CHART #: 1 SSN: 234-23-1640
MALE, WHITE/CAUCASION DOB: 09/05/1960 FIRST VISIT: 06/26/2001

>VASCULAR HISTORY

• NONE

>PATIENT RISK FACTORS

• HIGH LDL • LOW HDL • SMOKER • HYPERTENSION • OBESITY

>ADDITIONAL MEDICAL HISTORY

• NONE

>NATIONAL GUIDELINE RECOMMENDATIONS

• THE RECORD INDICATES THAT THE PATIENT HAS MULTIPLE CONDITIONS PLACING THEM AT "BORDERLINE-HIGH RISK" FOR THE DEVELOPMENT OF, OR INCREASE IN, CARDIOVASCULAR DISEASE.
• FOR THESE PATIENTS, THE NATIONAL CHOLESTEROL EDUCATION PROGRAM (NCEP) RECOMMENDS AN LDL-CHOLESTEROL GOAL OF LESS THAN 130 mg/dL.

MODIFICATIONS AND FOLLOW UP OFFICE VISIT IN 4-6 WEEKS.

>PHYSICIAN INFORMATION

• SECONDARY CAUSES OF HYPERLIPIDEMIA
• SECONDARY CAUSES OF OBESITY

>PHARMOCOTHERAPY RECOMMENDATIONS

• THE LDL-CHOLESTEROL IS ABOVE GOAL BUT NOT HIGH ENOUGH TO MEET THE NCEP CRITERIA FOR PHARMACOLOGIC THERAPY.
• RECOMMEND INITIATION OF DIETARY MEASURES TO REDUCE LDL-CHOLESTEROL, REGULAR EXERCISE, AND LIFESTYLE MODIFICATION TO HELP REDUCE CARDIOVASCULAR RISK.
• REPEAT LIPID PROFILE TESTING IN 4-6 WEEKS.

>DRUGS INITIATED

NONE AT THIS TIME

>DRUGS PRIOR TO VISIT

GENERIC NAME	BRANDNAME	DOSAGE SCHEDULE
	ATIVAN	0.5mg/prn
	PRILOSEC	20mg/qhs

FIG. 8A.

131

>FOLLOWUP RECOMMENDATIONS

- RECOMMEND PATIENT INCREASE HDL-CHOLESTEROL THROUGH INITIATION OF DIETARY MEASURES, ROUTINE EXERCISE, AND LIFESTYLE MODIFICATION.
- FOLLOW UP LIPID PROFILE RECOMMENDED IN 6 MONTHS UNLESS OTHER LIPID RISKS WARRANT TESTING SOONER.
- THE RECORD INDICATES THAT THE PATIENT IS CONSIDERED CLINICALLY OBESE AND NOT CURRENTLY ON A TREATMENT PLAN.
- RECOMMEND PATIENT EDUCATION REGARDING DIET, EXERCISE, AND LIFESTYLE MODIFICATION BEFORE BEGINNING PRESCRIPTION THERAPY.
- FOLLOW UP OFFICE VISIT IN 1 MONTH.
- ADVISE PATIENT THAT SHOULD SERIOUSLY CONSIDER QUITTING SMOKING.
- GIVE FOLLOW UP CALLS IN ONE WEEK AND THREE WEEKS TO PATIENT'S HOME

>PATIENT RECOMMENDATIONS

- YOUR PHYSICIAN HAS DETERMINED THAT YOU NEED MEDICATIONS TO HELP MANAGE YOUR BLOOD PRESSURE. TAKE THESE MEDICINES EXACTLY AS PRESCRIBED AND CONTINUE LIFESTYLE AND DIET MODIFICATIONS TO OPTIMIZE YOUR MEDICATION ROUTINE.
- RECOMMEND FOLLOW UP OFFICE VISIT IN 4-6 WEEKS AND MAINTAINING A BLOOD PRESSURE DIARY FOR YOUR PHYSICIAN TO REVIEW.

>PATIENT HANDOUTS

- INTRODUCTION TO CHOLESTEROL AND TRIGLYCERIDES
- REDUCING CHOLESTEROL THROUGH DIET
- LOW HIGH DENSITY LIPOPROTEIN CHOLESTEROL
- INCREASING HDL
- LOW HIGH DENSITY LIPOPROTEIN WITH NO DRUG THERAPY REQUIRED
- OBESITY
- YOU CAN STOP SMOKING

BACK | CLOSE | PRINT FOR PATIENT | PRINT FOR PHYSICIAN

FIG. 8B.