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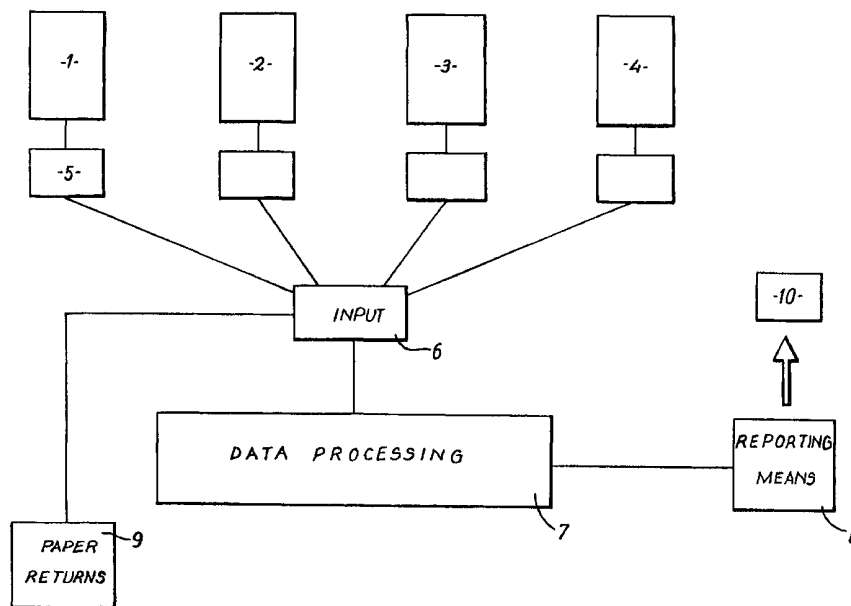
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- (71) Applicant (for all designated States except US): **HANON SOLUTIONS LIMITED** [GB/GB]; Hillington Park Innovation Centre, 1 Ainslie Road, Hillington, Glasgow G52 1RU (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **CANNON, Neville** [GB/GB]; Hanon Solutions Limited, Hillington Park Innovation Centre, 1 Ainslie Road, Hillington, Glasgow G52
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(54) Title: APPARATUS AND METHOD FOR INTEGRATING, SORTING AND ANALYSING HETEROGENEOUS DATA SETS



(57) Abstract: A system allows data stored on existing disparate data systems (1) to (4) to be extracted, standardised and integrated such that different organisations, areas and individuals can be compared against each other. In particular, the system allows heterogeneous data sets to be standardised and transmitted to a processing means (7) which can infer whether the standardised data sets are outwith a normal reference criteria or range and can alert a relevant body or person to the occurrence of an adverse event which may be associated with a location, organisation or individual.



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1 Apparatus and Method for Integrating, Sorting and
2 Analysing Heterogeneous Data Sets.

3
4 The present invention relates to apparatus and method for
5 extracting data sets from remote, disparate locations in
6 order that the data can be analysed and used to report
7 the occurrence of adverse events. In particular the
8 described apparatus and method can be used as an early
9 warning system to predict where an adverse event may
10 occur.

11
12 Clinical care within the NHS is generally of a very high
13 standard. However it would be unrealistic to expect that
14 accidents and mistakes do not occur during the provision
15 of health care in hospitals, surgeries and in the
16 community. There is an inevitable risk that, as medical
17 treatment relies largely on human intervention, mistakes
18 will occur from time to time. Unfortunately, when
19 mistakes are made by employees within the health service
20 the consequences tend to be far more serious than they
21 are in other occupations.

22
23 Although the majority of employees within the Health
24 Service have high clinical, ethical and professional

1 standards, instances of malpractice and incompetence do
2 occasionally occur. The consequences of these events can
3 be both devastating and distressing to the individual
4 patient and their families. This has been particularly
5 apparent over recent years as disturbing cases of
6 clinical malpractice are highlighted by the media.

7
8 It is estimated that nearly 28,000 written complaints are
9 made about aspects of clinical treatment in hospitals,
10 and 400 people die or are seriously injured in adverse
11 events involving medical devices every year. The
12 occurrence of such serious failures, not only undermines
13 public confidence, but also costs the Health Service an
14 estimated £400 million a year in settling clinical
15 negligence claims. Furthermore it is unclear whether
16 these official statistics reveal the true scale of these
17 problems. Many incidents remain unreported or unnoticed,
18 and incident reporting systems are particularly poor
19 within primary care. Most incidents which are reported
20 tend to be of a serious nature, where serious malpractice
21 or injury has occurred to the patient and reporting of
22 "near-misses" are almost non-existent. In this manner,
23 any action taken tends to be reactive to incidents which
24 have occurred as opposed to proactively trying to prevent
25 future incidents from occurring.

26
27 It is therefore essential that there is a facility in
28 place to report when and where such incidents take place,
29 in order that action can be taken to prevent any further
30 such incidents. There are at present a number of
31 reporting systems in place within the NHS. These include
32 local and regional reporting schemes, complaints systems,
33 external reviews, incident enquiries and audits. However

1 there is little consistency in these systems around the
2 country. It will be appreciated that within the NHS
3 there exists a number of different health care providers
4 including doctors, nurses, community workers and
5 affiliated occupations, working within a number of
6 different health care environments such as hospitals,
7 surgeries and in the community. Consequently there
8 exists a diversity of data record storage and reporting
9 systems (Patient Administration Systems) which differ in
10 format and content.

11
12 It would be advantageous to integrate and standardise
13 these data systems, as this would permit comparisons to
14 be made regarding the performance of individual providers
15 and would also allow areas to be identified where there
16 may be cause for concern. However there is no single
17 system that can collate this information in order to
18 assess the incidence of adverse effects around the
19 country so that different trusts, organisations or
20 individuals can be compared.

21
22 Unfortunately there are various obstacles to the
23 centralisation or sharing of such data systems. It is a
24 recognised problem that there is an incomplete IT
25 structure within the Health Service and there are limited
26 resources or IT expertise. It will be appreciated that
27 it would be unduly expensive to provide every provider
28 with a new system, and that it is likely that there would
29 be some reluctance to change existing work practices and
30 embrace complex new systems. There is also the question
31 of patient confidentiality, and accordingly any data used
32 in an analytical or reporting manner would have to be
33 secure.

1

2 There is therefore a need for a system which can extract
3 data from existing disparate sources in a secure and
4 confidential manner, in order that such data can be
5 standardised into a format which can be used to predict
6 areas, organisations or individuals where mistakes or
7 adverse events are occurring frequently or repeatedly, in
8 order to warn against clinical problems or malpractice
9 and to prevent such adverse events from taking place in
10 the future.

11

12 It is an object of the present invention to provide a
13 system which can intelligently extract data from a
14 plurality of remote disparate locations.

15

16 It is a further object of the present invention to
17 provide a system which allows data stored on existing,
18 disparate data systems, to be extracted and integrated
19 such that different organisations, areas and individuals
20 can be compared against each other.

21

22 It is a further object of the present invention to
23 provide a system which allows data stored on existing,
24 disparate data systems, to be extracted and integrated
25 such that it can be analysed against set criteria or
26 benchmarks in order to assess the risk of an adverse
27 effect occurring.

28

29 According to the present invention, there is provided a
30 data analysis system for use in determining the
31 occurrence of adverse events represented in heterogeneous
32 data sets, the system comprising;

- 1 a) means for formatting and transmitting said
2 heterogeneous data sets to a central processing
3 means in a standardised format,
4 b) inference means for determining whether the data
5 sets are outwith a "normal" reference criteria or
6 range,
7 c) reporting means for reporting adverse events
8 associated with locations, organisations or
9 individuals.

10

11 Preferably the system comprises a centralised platform
12 and one or more local platforms.

13

14 Preferably the centralised platform receives data in a
15 standardised format from the one or more local platforms.

16

17 Preferably the one or more local platforms act as a
18 gateway through which data must pass in order to be
19 standardised.

20

21 Preferably data is transmitted from the one or more local
22 platforms to the centralised platform.

23

24 The system may be used to report and predict the
25 occurrence of adverse events within a community, wherein
26 the community is typically an official organisation such
27 as the National Health Service, Civil Service or Police
28 Force.

29

30 The central processing means typically comprises at least
31 one database.

32

1 The heterogeneous data sets are typically located within
2 a plurality of remote locations.

3

4 Preferably the heterogeneous data sets are extracted,
5 formatted and transmitted from the remote locations to
6 the central processing means by one or more acquisition
7 server.

8

9 Preferably the heterogeneous data sets are formatted into
10 a standardised format by an acquisition server schema.

11 Typically the one or more acquisition server schema hold
12 a plurality of mapping tables.

13

14 Preferably data is standardised within the system by the
15 attachment of codes.

16

17 Most preferably the one or more acquisition servers holds
18 national coding standards and mappings of local data.

19

20 Preferably the system also comprises a national code sets
21 warehouse.

22

23 Preferably the national codes held within the local
24 acquisition server are synchronised with the national
25 codes held within the national code sets warehouse.

26

27 Preferably a normalisation engine attaches national codes
28 to the data.

29

30 Preferably the system also comprises a data cleanse
31 application. Most preferably the data cleanse

32 application will extract irregular data and send it to a

1 suspense area. The data can then be accessed for
2 correction or re-submission.

3

4 Preferably users can upload data directly to the
5 acquisition server.

6

7 The inference means is typically a hardware or software
8 engine which operates in programming language applicable
9 to the computer system or network with which it is used.

10

11 The inference means typically applies a series of rules
12 in order to analyse the risk of an adverse event
13 occurring and to predict where an adverse event may
14 occur. For example, the inference means may calculate
15 the "normal" or average number of deaths per year of
16 patients having a particular illness, and then deduce
17 which, if any of the data sets deviate widely from this
18 number.

19

20 The inference means may also comprise a statistical
21 analysis programme.

22

23 Preferably the central processing means is adapted to
24 receive information from printed source material.

25

26 Preferably the criteria and ranges against which the data
27 sets are assessed are easily adjustable.

28

29 The data may be communicated from the remote data
30 locations to the central data storage means in an
31 encrypted and secure format. The data may be
32 communicated from the remote data locations to the

1 central data storage means via an existing database
2 system, such as NHSnet.

3

4 The data may be communicated in XML.

5

6 Preferably the reporting means can be escalated.

7

8 Preferably the system has an incident acknowledgement and
9 closure application.

10

11 According to a second aspect of the present invention
12 there is provided a computer program comprising program
13 instructions which, when loaded into a computer,
14 constitute the data analysis system according to the
15 first aspect of the present invention.

16

17 According to a third aspect of the present invention
18 there is provided a method for determining the occurrence
19 of adverse events from heterogeneous data sets comprising
20 the steps of:

21

- 22 a) formatting the heterogeneous data sets into a
23 standardised format;
- 24 b) transmitting the standardised data sets to a central
25 processing means,
- 26 c) inferring whether the standardised data sets are
27 outwith a normal reference criteria or range, and;
- 28 d) reporting the occurrence of an adverse event
29 associated with a location, organisation or
30 individual.

31

32 An example embodiment of the present invention is
33 described with reference to the following figure:

1
2 Figure 1 is a schematic diagram of a simplified exemplary
3 embodiment of the system in accordance with the present
4 invention, and

5
6 Figure 2 is a more detailed schematic diagram of the
7 extraction, transfer and processing of data from one
8 remote data location to a relevant body or individual.

9
10 Referring firstly to Figure 1, a plurality of remote data
11 locations (1) (2) (3) and (4), data extraction formatting
12 and transmitting means (5) and (6), data processing means
13 (7), and indicating means (8) together form an exemplary
14 embodiment of the present invention. The exemplary
15 embodiment is for use within the National Health Services
16 and the remote data locations (1) to (4) may be clinical
17 based patient administration systems (PAS), which
18 presently exists within hospitals, surgeries and trusts.
19 These existing patient administration systems contain
20 information and data which relate to patient medical
21 history, such as treatment schedules, practitioner's
22 name and location, and locations where particular events
23 take place. However the format and information contained
24 on these systems will usually vary markedly. In addition
25 the actual systems and IT infrastructure will generally
26 vary from location to location. The system of the
27 present invention can determine the occurrence or
28 incidence of adverse events or "clinical incidents"
29 within the Health Service. Specifically the system
30 extracts, standardises and transmits heterogeneous data
31 sets thereby allowing the data sets to be analysed
32 against set criteria, enabling clinical incidents to be
33 identified, and most importantly reported to a relevant

1 party to ensure that action is taken to remedy the
2 incident, and prevent further incidents from taking
3 place.

4

5 The system of the present invention is divided into two
6 main systems, a National Information Delivery Platform
7 and Local Data Acquisition Platforms. The National
8 Information Delivery Platform is a centralised
9 information centre into which normalised, standardised
10 and validated clinical incidents are loaded, and this
11 system will host all the data against which the present
12 invention analysis and reports will process.

13

14 The Local Data Acquisition Platforms (5) are located in
15 various DH locations and act as a gateway through which
16 incident data must pass. All incident data generated
17 will be validated, normalised and standardised through
18 these systems. Only when these processes have been
19 achieved will the incident data be allowed onto the
20 National Delivery Platform.

21

22 The data extraction and formatting means extracts
23 predetermined data sets from the main types of patient
24 administration systems (1) to (4) automatically. It is
25 envisaged in the present invention that it would be
26 advantageous if the type of data which is extracted could
27 be adjusted to suit the needs of the relevant body or
28 individual (10) to which the warning would be given. For
29 example where the system is used within the national
30 health service, it is envisaged that the Department of
31 health and/or NHS Executive would have an active role in
32 deciding the nature of the data which is to be reported
33 on. The system also is also adapted to receive paper

1 returns (9). Once the information is extracted either
2 automatically from the existing administration systems or
3 via paper returns, it is standardised by translation
4 means (5) and transmitted via an input means (6) to the
5 central processing means (7). It will be appreciated
6 that in alternative embodiments the translation means (5)
7 and input means (6) may be combined.

8
9 Typically within the system an acquisition server schema
10 will be built to hold a series of mapping tables which
11 will be used to maintain a universal keying system
12 throughout the entire system deployment. Because
13 incident data will be uploaded from a large variety of
14 sources and locations (1) to (4), it is important that
15 the data is normalised into a common format before it is
16 entered into the National Delivery system, which in the
17 embodiment is represented by (7). The Acquisition Server
18 Schema will not only hold the national coding standards
19 relevant to the National Delivery System, for example
20 readcodes, OCS, ICD and/or OPCS, it will also contain
21 mappings of local data (11) relevant to the Local Data
22 Acquisition Platforms. This is important, for example,
23 within a hospital where there may be discrepancies in
24 patient information, i.e. a single patient may have more
25 than one code across various systems or various
26 departments. If this is found, the codes will be mapped
27 to one of the system identifiers for the patient, and it
28 is that identifier which will be passed with the incident
29 data to the national database.

30
31 It is strongly preferred that the data is transferred in
32 a secure and encrypted format to prevent tampering with
33 the system and to ensure patient confidentiality. In one

1 embodiment the data is transmitted via the existing NHS
2 web-server, NHSnet, to ensure maximum security. The data
3 is typically transferred using XML (extensible mark-up
4 language). A document type definition will define the
5 data upload format for interfacing systems, both on and
6 off line. Any clinical incident that is processed by the
7 acquisition servers will be in an XML format conforming
8 to Data Upload DTD.

9

10 The system typically also comprises a national coding
11 synchronisation manager, which synchronises the image of
12 the national codes held within the local acquisition
13 server (5) with the national code sets warehouse (13)
14 that holds the latest versions of the codes. The
15 Synchronisation manager may also be able to upload
16 national code sets from off line storage media.

17

18 The existence of a normalisation engine relating to the
19 Acquisition Server is the key to the success and quality
20 of the information delivered from the national
21 information delivery platform. The engine takes each
22 reported incident and breaks it down into all of its
23 elements. It looks at each of the elements individually
24 and ensures that the relevant national codes are attached
25 to it. For example, an incident may have the following
26 attributes: patient(s), doctor(s), nurse(s), location,
27 ward, diagnosis, drug(s) and disease. The normalisation
28 engine will attach a national code to each of these
29 attributes.

30

31 In the case of a patient, a unique code will be generated
32 if the patient has not already had an incident recorded
33 on the acquisition server. This code will be unique to

1 the system of the present invention. The patient mapping
2 table on the acquisition server will be updated with a
3 reference of the patient's originating code, i.e. the
4 code held on the originating hospital system. This
5 originating code will point to the unique code of the
6 system of the present invention. By maintaining this
7 mapping table on the acquisition server, other incidents
8 originating from other systems within the same hospital
9 can be mapped to the same unique patient code of the
10 system of the present invention. In the case of the other
11 attributes, the normalisation engine will find the
12 appropriate codes from the local image on the acquisition
13 server of the national codes.

14

15 The system also comprises a mapping tables manager which
16 is used to maintain the local mapping tables on the
17 acquisition server (5). The mapping tables will be
18 updated by the mapping tables manager application, the
19 normalisation engine and by a on-line data cleanse
20 application (14). The latter is an on-line user
21 application that is used to clean data that has failed
22 the validation and normalisation process.

23

24 When data has been uploaded from systems that cannot be
25 reconciled to codes either in the national codes set or
26 the mapping tables of the system of the present
27 invention, the normalisation engine will drop these
28 upload items into a suspense area (15). Users of the
29 originating system will then be notified by the
30 acquisition server (5) that there are items in suspense
31 outstanding. The users will subsequently come on-line
32 with the data cleanse application and correct the data.

33

1 It will be appreciated that in existing systems within
2 the National Health Service it is difficult, if not
3 impossible, to monitor the information entered into
4 existing systems. For example, in a system where it is
5 necessary for a nurse or doctor to enter their unique
6 identification number or a unique patient number, one
7 pre-entered number may be used many times by many
8 different doctors or nurses for the sake of expedience.
9 In the event that the system of the present invention
10 detects that irregular data has been entered, this data
11 will be pulled out and sent back to the transmitting
12 means for correction or re-submission. This can be seen
13 as 14 in Figure 2, and is an essential part of the system
14 of the present invention as it greatly increases data
15 quality within the system.

16

17 An on-line upload application is also provided which
18 allows users to upload adverse clinical incident data
19 directly to the acquisition database (5). The normalised
20 data gateway acts as a "pipe" through which the processed
21 clinical incident data will be pushed into the national
22 database of the present invention. This incident data
23 will then be deleted from the acquisition database.

24

25 The central data processing means (7) decrypts and stores
26 the data. The information is then processed at an
27 initial level by inference in the data processing means
28 (7), which is typically a hardware or software engine,
29 and which applies a set of rules to the data sets in
30 order to predict locations, organisations or individuals
31 where they may be cause for concern. For example, where
32 the system is used within the National Health Service,
33 the inference means may determine the "normal" number of

1 deaths within a particular group of patients, and then
2 use this data to determine whether any particular
3 practitioner or location appear to deviate from this
4 norm. Alternatively the system may be used to compare
5 the number of complaints made against different
6 organisations, locations and individuals. The data may
7 then be drawn into a statistical analysis component
8 program to further refine and analyse the data.

9
10 The data processing means (7) comprises a delivery
11 database schema which will hold on a national level all
12 of the adverse clinical incidents reported through the
13 various localised acquisition servers. The foundation
14 for the schema design was driven by the need to create an
15 analytical platform upon which many algorithms could run.
16 It is tuned to delivery a variety of results for
17 reporting a range of formats, including graphical images.
18 It is also designed to perform a high level of
19 performance and be extremely scaleable to accommodate
20 large volumes of data.

21
22 The incidents alerts engine is a stand-alone system that
23 is highly scaleable in that multi instances of the engine
24 can run on separate machines, upgrading processor power
25 limitlessly. The engine runs analysis algorithms on the
26 database, then cross-references the user profiles for
27 notification parameters that it then sends to the
28 notification gateway. The alerts engine runs on a
29 hierarchical model, whereby it determines whether
30 previous alerts have been acknowledged and where
31 applicable it will escalate the alert up the chain of
32 command.

33

1 The reporting module (8) will report the results to the
2 relevant body or individual (10). For example, this may
3 be the Chief executive of the particular Trust in which a
4 particular area of concern has been identified. The
5 reporting module (8) may be configured to operate in a
6 number of ways, for example if we have a number of
7 indicator means to highlight possible areas,
8 organisations or individuals of concern. The indicator
9 means may be, in one example, warning lights of red,
10 amber and green, which warn an individual or organisation
11 that action needs to be taken. Alternatively, alerts may
12 be given by e-mail or SMS. For example the reporting
13 means (8) will warn if the results obtained from analysis
14 of a particular data set deviates from a "normal" range
15 or benchmark criteria. The reporting module (8) will
16 issue a warning, for example, to the Chief Executive of
17 the particular trust (10) to monitor the given situation
18 and to take pre-emptive action to remedy the area
19 concerned before a crisis emerges. In one embodiment,
20 the indicator means providing an early warning would be
21 an illumination of a particular colour of light, for
22 example, the amber light. If no action was taken, the
23 warning would progress to red, then the warning would
24 progress to illumination of the red light to indicate
25 that determined action should be mandated.

26
27 This "escalating" alert system is seen as a particularly
28 important aspect of the present invention. In one
29 embodiment, the escalation may arise from the use of
30 indicator means as described above. However, in an
31 alternative embodiment, the escalation system may provide
32 warnings in an escalated manner through a hierarchy of
33 organisations or individuals. For example, in the case

1 of the National Health Service, in the first instance, a
2 Ward Sister may be given a warning and if no action is
3 taken on this warning, a subsequent warning may be given
4 to the Head of the Department in which the Ward Sister
5 works. In this vein, later escalated warnings could be
6 given, for example, to a Medical Director or to the
7 Health Service Head.

8
9 A further important aspect of the present invention is
10 the provision of an incidents acknowledge and closure
11 application, which is web based and built with the latest
12 application server technology. High scaleable, robust
13 and performant, it takes advantage of the latest multi-
14 tier platform architecture to provide rapid development
15 environment for building maintainable solutions. This
16 application will be very secure, but at the same time
17 available to browser based clients running in any remote
18 location. Incidents will be updated from the upload
19 state into an acknowledged state during which
20 investigations will be carried out. The incident will
21 next be closed using the same application when the
22 resulting outcome is recorded. In other words, repeated
23 updates will be sent until acknowledgement is obtained
24 from the organisation or individual to which a warning has
25 been sent, that the warning has in fact been received and
26 action will be taken. Closure will only come about once
27 a suitable action has been carried out.

28

29 Delivery of the data is carried out on information
30 delivery mechanisms which are built to the last Java Open
31 standards. Developing the Internet applications to J2EE,
32 Sun's Java specification ensures the build will be
33 compliant with the leading application and web server

1 platforms. This ensures that the build will be compliant
2 with new developments in the information delivery arena.

3

4 The multiple tier architecture enables the use of
5 application servers to host Enterprise Java Beans that
6 contain the delivery system business logic of the present
7 invention. Keeping this logic separate means the
8 application code can be maintained and upgrade separately
9 from the presentation of that logic. This makes it very
10 easy to accommodate new requirements with a minimum of
11 disruption to a live system. The presentation logic is
12 contained within web servers, servlets and JSPs. There is
13 also a separate tier on the architecture that can be
14 maintained separately with all the benefits that this
15 brings. Multiple user connections are managed with the
16 web servers where sessions are tracked and kept secure.
17 Having a multiple tier architecture also ensures multiple
18 options for scaling the system to accommodate very large
19 volumes of users.

20

21 It will also be appreciated that particularly in fields
22 such as the Health Service, it is important that all data
23 is transmitted and obtained in a secure environment. The
24 system of the present invention has Internet portal
25 security which is guaranteed with a combination of
26 features included. Netscape servers LDAP authentication
27 system provides secure log-on interface to the portal.
28 This combined with a firewall surround provides a very
29 secure environment to host the national information
30 delivery platform.

31

32 An advantage of the present invention is that it
33 overcomes the short-comings of existing systems without

1 being unduly expensive, as it utilises existing data
2 systems which already exist, but which cannot be used for
3 comparative analysis as they exists in disparate format
4 and content.

5
6 A further advantage lies in the fact that the individual
7 health care providers do not need to change their
8 existing recording or reporting systems as the invention
9 provides means for integrating the existing disparate
10 data.

11
12 A yet further advantage of the present invention lies in
13 the fact that the system provides a unified and
14 standardised system for reporting and analysing adverse
15 events, using data which already exists in clinically
16 based patient administration systems. The system
17 integrates agreed data sets and allows reporting
18 protocols to be standardised so that an early warning can
19 be given in relation to individuals or areas of concern.

20
21 It is recognised that although the present invention has
22 been described in relation to the National Health
23 Service, the system would have useful application in
24 other organisations, for example, within the Police Force
25 or Civil Service.

26
27 Further modifications and improvements will be
28 incorporated without departing from the scope of the
29 invention herein intended.

1 **CLAIMS**

2

3 1. A data analysis system for use in determining the
4 occurrence of adverse events represented in
5 heterogeneous data sets, the system comprising means
6 for formatting and transmitting said heterogeneous
7 data sets to a central processing means in a
8 standardised format, inference means for determining
9 whether the data sets are outwith the "normal"
10 reference criteria or range, and reporting means for
11 reporting adverse events associated with locations,
12 organisations or individuals.

13

14 2. A data analysis system as claimed in Claim 1,
15 comprising a centralised platform and one or more
16 local platforms.

17

18 3. A data analysis system as claimed in Claim 2,
19 wherein the centralised platform receives data in a
20 standardised format from the one or more local
21 platforms.

22

23 4. A data analysis system as claimed in Claims 2 - 3,
24 wherein the one or more local platforms act as
25 gateway through which data must pass in order to be
26 standardised.

27

28 5. A data analysis system as claimed in Claims 2 - 4,
29 wherein data is transmitted from the one or more
30 local platforms to the centralised platform.

31

32 6. A data analysis system, as claimed in any one of the
33 preceding Claims, used to report and predict the

- 1 occurrence of adverse events within a community,
2 wherein the community is typically an official
3 organisation, such as the National Health Service,
4 Civil Service or Police Force.
5
- 6 7. A data analysis system as claimed in any one of the
7 preceding Claims, wherein the central processing
8 means comprises at least one database.
9
- 10 8. A data analysis system as claimed in any one of the
11 preceding Claims, wherein the heterogeneous data set
12 are located within a plurality of remote locations.
13
- 14 9. A data analysis system as claimed in any one of the
15 preceding Claims, wherein data is standardised by
16 the attachment of codes.
17
- 18 10. A data analysis system as claimed in any one of the
19 preceding Claims, wherein the heterogeneous data
20 sets are extracted, formatted and transmitted from
21 the remote locations to the central processing means
22 by one or more acquisition server.
23
- 24 11. A data analysis system as claimed in Claim 10,
25 wherein the one or more acquisition servers holds a
26 plurality of mapping tables.
27
- 28 12. A data analysis system as claimed in Claims 10 - 11,
29 wherein the one or more acquisition server holds
30 national coding standards and mappings of local
31 data.
32

- 1 13. A data analysis system as claimed in Claims 9 - 12,
2 comprising a national code set warehouse.
3
- 4 14. A data analysis system as claimed in Claims 9 - 13,
5 wherein a normalisation engine attaches national
6 codes to the data.
7
- 8 15. A data analysis system as claimed in any one of the
9 preceding Claims, having a data cleanse application.
10
- 11 16. A data analysis system as claimed in Claim 10,
12 wherein users can upload data directly to the one or
13 more acquisition servers.
14
- 15 17. A data analysis system as claimed in any one of the
16 preceding Claims, wherein the inference means is a
17 hardware or software engine which operates in a
18 programming language applicable to the computer
19 system and network which it is used.
20
- 21 18. A data analysis system as claimed in any one of the
22 preceding Claims, wherein the inference means
23 applies a series of rules in order to analyse the
24 risk of an adverse event occurring, and to predict
25 where an adverse event may occur.
26
- 27 19. A data analysis system as claimed in any one of the
28 preceding Claims, wherein the inference means
29 comprises a statistical analysis program.
30
- 31 20. A data analysis system as claimed in any one of the
32 preceding Claims, wherein the central processing

1 means is adapted to receive information from printed
2 source material.

3

4 21. A data analysis system as claimed in any one of the
5 preceding Claims, wherein the criteria and range
6 against which the data sets are assessed are easily
7 adjustable.

8

9 22. A data analysis system as claimed in any one of the
10 preceding Claims, wherein the data is communicated
11 from the remote data locations to the central data
12 storage means in an encrypted and secure format.

13

14 23. A data analysis system as claimed in any one of the
15 preceding Claims, wherein the data is communicated
16 from the remote data locations to the central data
17 storage means via an existing database system, such
18 as NHSnet.

19

20 24. A data analysis system as claimed in any one of the
21 preceding Claims, wherein the data is communicated
22 in XML.

23

24 25. A data analysis system as claimed in any one of the
25 preceding Claims, wherein the reporting means can be
26 escalating.

27

28 26. A data analysis system as claimed in any one of the
29 preceding Claims, wherein the system has an incident
30 acknowledgement and closure application.

31

- 1 27. A computer program comprising program instructions
2 which, when lodged into a computer, constitute the
3 data analysis system as claimed in Claims 1 - 25.
4
- 5 28. A method for determining the occurrence of adverse
6 events from heterogeneous data sets comprising the
7 steps of formatting the heterogeneous data sets into
8 a standardised format, transmitting the standardised
9 data sets to a central processing means, inferring
10 whether the standardised data sets are outwith the
11 normal reference criteria or range, and reporting
12 the occurrence of an adverse event associated with a
13 location, organisation or individual.

