Title: A HAND-HYGIENE BEHAVIOUR MONITORING SYSTEM

Abstract: The invention relates to a hand-hygiene behaviour monitoring system, comprising: means for detecting the occurrence of an event specified in a hand-hygiene rule, wherein the event involves a person; means for updating behaviour data that is related to acts according to the hand-hygiene rule, wherein said means for determining whether the person performs an act that is relevant for the hand-hygiene rule is at least one first hidden sensor.
A hand-hygiene behaviour monitoring system

The invention concerns a hand-hygiene behaviour monitoring system comprising means for detecting the occurrence of an event specified in a hand-hygiene rule, wherein the event involves a person; and means for updating behaviour data that is related to acts according to the hand-hygiene rule.

Such a hand-hygiene behaviour monitoring system is known from US 2004/0001009 A1. According to this publication a method and system for monitoring hand-washing compliance is disclosed which involves determining whether a person washes his or her hands within a period of time subsequent to a reminder alarm that is triggered upon a person entering or leaving a room in an institution such as a hospital.

The known method and system is well devised to help the persons to comply with the hand-washing rule. However, it does not suit for the purpose of monitoring hand-hygiene behaviour over a certain period of time in order to provide management of the institution with a tool to suppress infections, save on costs, improve hospital image and eventually save lives.

Research shows that one out of ten patients in a hospital gets infected and on a yearly basis in the US hundred thousand people die as a result of an infection in a hospital environment. In terms of money this means an annual loss of $ 4,500,000,000.

The invention has as an object to provide a management information system for monitoring hand-hygiene behaviour which is applicable in a hospital environment primarily, but can also be used elsewhere (such as for instance the food-industries), and which system provides a tool for monitoring the hand-hygiene behaviour over time without the system itself influencing each person’s behaviour in abiding the hand-hygiene rule. Maintaining hand-hygiene as meant herein comprises the follow-up of a hand-washing rule but also disinfection by use of alcohol or any other use of detergent.

The hand-hygiene behaviour monitoring system of the
invention is therefore embodied in accordance with anyone of the appended claims.

In a first aspect of the invention the hand-hygiene behaviour monitoring system has at least one first hidden sensor for determining whether the person performs an act that is relevant for the hand-hygiene rule. With such a hidden sensor or sensors true measurements can be obtained of the actual uninfluenced hand-hygiene behaviour of the concerning persons.

In a further aspect of the invention the sensor has a wireless communication channel with said means for updating behaviour data. This not only allows an easy expandability of the hand-hygiene behaviour monitoring system of the invention, but also allows swift and easy relocation of the sensor or sensors allowing to investigate whether there is any position-dependency in following the hand-hygiene rule when the observations are in one place or in another place of - for instance - the mentioned hospital environment.

Advantageously the means for updating behaviour data is a data processing machine such as a computing device.

The objectives and advantages of the system according to the invention are further promoted when the wireless communication channel involves an antenna connected to the first sensor, which antenna is also hidden.

In still another aspect of the invention the hand-hygiene behaviour monitoring system comprises in the wireless communication channel one or more distributed hubs for collecting, amplifying and further transferring signals from the sensor or sensors. By means of the distributed hubs an effective shielding of telecommunication signals that are abundantly present in a hospital environment can be secured and spurious responses effectively suppressed. Furthermore, the hubs can be placed in corridors where there is less sensitivity for signals reflected from the walls.

In still another aspect of the invention the hand-hygiene behaviour monitoring system is arranged such that the at least one first sensor regularly sends an alive signal. In this way the reliability of the system can quite easily be
secured and monitored such that also in case the time-intervals between hand-washing activities become very large, one still knows that the system is alive and well.

Advantageously there is a second sensor for monitoring the occurrence of an event involving a person and requiring thereafter compliance with a hand-hygiene rule, wherein said second sensor is placed at a position so as to become unavoidably activated upon entering a confined area.

In such a system it is possible to measure compliance with the hand-hygiene rule provided the first hidden sensor is located in or nearby said confined area and is arranged for measuring an event that is indicative for compliance with the hand-hygiene rule. Therefore, this latter sensor should be hidden in a soap or alcohol dispenser or a similar device.

With the system having the second sensor as just mentioned, the confined area is preferably selected from a group comprising a lavatory, an incubator, an operational room.

In a further preferred embodiment the at least one first sensor comprises a detector for an rfid transmitter carried by a person. In this way it is possible to measure behaviour or compliance data on a personal level.

The invention will hereinafter further be elucidated with reference to an exemplary embodiment of the hand-hygiene behaviour monitoring system of the invention as applied in a hospital environment, and with reference to the appended drawing.

In the drawing schematically the hand-hygiene behaviour monitoring system of the invention is shown comprising means 1 for detecting the occurrence of an event specified in a hand-hygiene rule. These means are intended to involve a person active in the act of washing or disinfecting hands or not washing or disinfecting hands. Said means for detecting the hand-hygiene behaviour is made part preferably of a soap- or alcohol-dispenser located in a patient room 2. Also in other rooms 3, 4 or 5 and in other patient departments 6, 7, 8 such hidden sensors are located. When the sensor is located
in a soap-dispenser of a lavatory or similar, preferably also the lavatory-door is provided with a sensor, so as to be able to measure after the door-sensor has become activated, whether also the first-mentioned sensor becomes activated and the hand-hygiene rule is complied with.

Measurement of hand-hygiene rule compliance is also possible in an operating theatre or in connection with the use of an incubator, depending on whether the entrance of the operating room or the opening of the incubator is measured through application of a second sensor which monitors same. In such a situation the sensor which is hidden in the soap dispenser nearby the operating room or the incubator indicates whether or not the hand-hygiene rule is complied with.

The signals from the sensors 1 are picked up by hubs 9, 10 and 11 which are located at different places throughout the hospital environment at which the hand-hygiene behaviour monitoring system of the invention is placed.

Communication between the sensors 1 and the respective hubs 9, 10 and 11 occurs wirelessly whereas the hubs 9, 10, 11 may be connected through a copper backbone 12 to means 13 for updating behaviour data which takes the form of a data processing machine or a computing unit.

In the data processing machine 13 collection and registering of the data occurs as well as statistical calculations to monitor the development of the hand-hygiene rule behaviour in the course of time.

The data from the data processing machine 13 may be made available to management or to a dedicated department for infection control and prevention 14 which department may organise feedback to the persons working in the hospital environment, and for the purpose of developing and organising training of said personal as well as, when matters get out of hand, intervene in the actual behaviour of the persons who should abide the hand-hygiene rule.

Measurement of the hand-hygiene rule behaviour or compliance on a personal level is possible if each concerning person carries a rf-id transmitter and the hidden sensor or sensors comprise a detector for such a rf-id transmitter.
CLAIMS

1. A hand-hygiene behaviour monitoring system, comprising:
   means for detecting the occurrence of an event specified in a hand-hygiene rule, wherein the event involves a person;
   means for updating behaviour data that is related to acts according to the hand-hygiene rule, characterized in that said means for determining whether the person performs an act that is relevant for the hand-hygiene rule is at least one first hidden sensor.

2. A system according to claim 1, wherein the sensor has a wireless communication channel with said means for updating behaviour data.

3. A system according to claim 1 or 2, wherein said means for updating behaviour data is a data processing machine.

4. A system according to claim 2 or 3, wherein the wireless communication channel involves an antenna connected to the first sensor, which antenna is hidden.

5. A system according to any one of claims 2-4, wherein the wireless communication channel comprises one or more distributed hubs for collecting and further transferring signals from the sensor or sensors.

6. A system according to any of the preceding claims, wherein the at least one first sensor regularly sends an alive signal.

7. A system according to any one of the preceding claims, wherein there is a second sensor for monitoring the occurrence of an event involving a person and requiring thereafter compliance with a hand-hygiene rule, and that said second sensor is placed at a position so as to become unavoidably activated upon entering a confined area.

8. A system according to claim 7, wherein the confined area is selected from a group comprising a lavatory, an incubator, an operational room.
9. A system according to any one of the preceding claims, wherein the at least one first sensor comprises a detector for a rf-id transmitter carried by a person.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. G08B21/24

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>Y</td>
<td>Chapters [0032]-[0035], [0039], [0043]-[0045] figures 1-4</td>
<td>9</td>
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**Further documents are listed in the continuation of Box C.**

**Data of the actual completion of the international search**

13 December 2007

**Date of mailing of the international search report**

21/12/2007

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<tr>
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<th>Publication date</th>
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<tbody>
<tr>
<td>US 2004001009 A1</td>
<td>01-01-2004</td>
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