Design document

for the alarm system

in the ABT Trykskade project

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1 Table of Content

2 Scope

The scope of this document is to give an introduction and description of the alarm system developed as part of the ABT Pressure injury project. The document is split into a background section, a section for the system architecture, a SW section and a section for the HW implementation.

3 Background theory

As part of the ABT Pressure injury project two different sensor sheet systems were evaluated. Based on these evaluations and clinical pretrial it was decided to use the XXX sensor sheet as the final choice of technology. Even though the sensing technology is in place the original system is lacking of alarm functionality and therefore such functionality has been developed and build on top of the XXX monitoring software. The whole system is described in further detail in section 4 System overview.

In the project a new method for screening of the patients was developed and implemented. This screening method is among other things used to reduce the total time the patient is allowed to lie in the same position. The main factors for determining the time reduction is integrated as part of the user interface in the developed software.

The PC software that is build on top of the XXX software is based on LabVIEW and controls the XXX software to a certain degree meaning that the user only has to execute one file. There has been very high focus on making the GUI of the software as user friendly as possible, meaning that very few actions or inputs are needed from the user. In addition to that the software is made secure in a way that only one path can be followed by the user and by that risk of input mistakes is minimized. E.g. the personal ID number (CPR nr) shall contain exactly 10 numbers otherwise the user is told by the software to reenter the number before being able to proceed.

4 System overview

The whole system is configured as described in Figure 1 schematically showing the PC with build-in monitor as the central unit in the system receiving data from the XXX Pressure sensitive sheet placed in the bed under the patient. On the PC the software (LabVIEW application) runs on top of and to a certain degree controlling the XXX PC software. The LabVIEW software is described in further detail in section 5 PC software. The PC manages the alarm that is displayed locally on the monitor and sent via the relay box to the Nurse Pad Finder system used by the nurses on the ward.
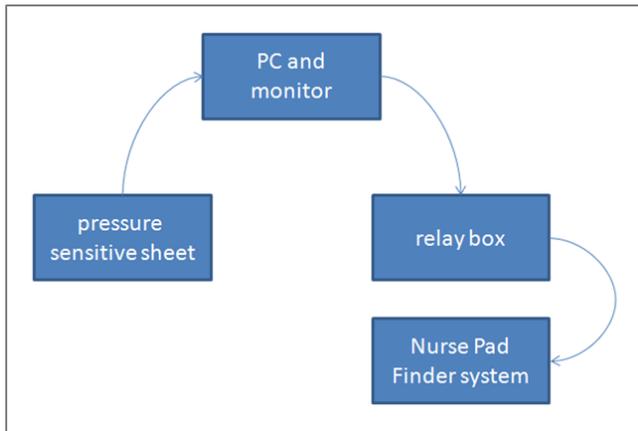
Figure 1 Schematic system overview

4.1 Data acquisition

The XXX system is a complete system managing the data collection, analysis and monitoring. This system is not interrupted or manipulated by the LabVIEW system software which is rather build on top of the XXX PC application.

5 PC software

As described a LabVIEW application is developed and build on top of the PC software supplied by XXX. By laying a shell over the XXX and controlling the data acquisition and visual monitoring programmatically all user inputs are avoided on that point.

In general terms the LabVIEW application manages the inputs from the user, typically a nurse or other nurse aiding staff, and translates the inputs into a calculated maximum positioning time of the patient before repositioning. As the time reaches zero an alarm is shown visually on the monitor and the alarm is sent to the Nurse Pad Finder system indicating to the nurse that the patient has to be repositioned. The user inputs required are CPR number, risk factor from the initial screening of the patient, individual risk parameters.

The simplified user interface is demonstrated in different user situations in Figure 2, Figure 3 and Figure 4.
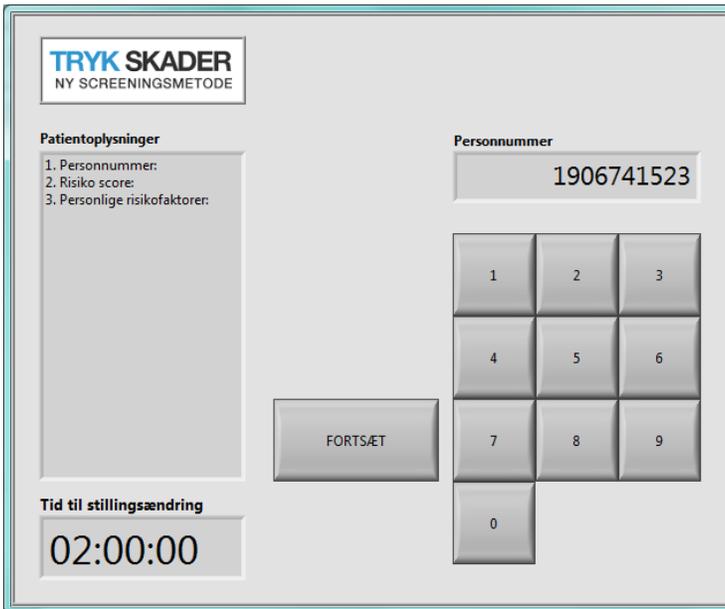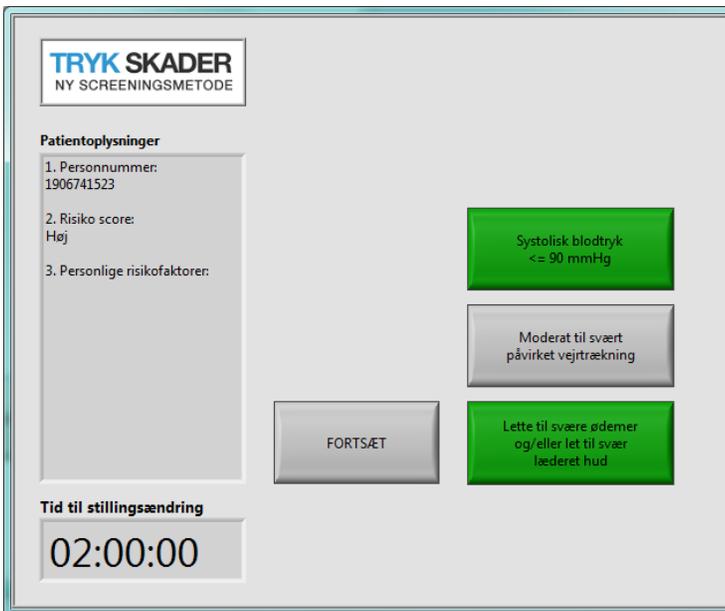
Figure 2 GUI with CPR number entered

Figure 3 GUI with CPR number, risk score and personal risk factors entered
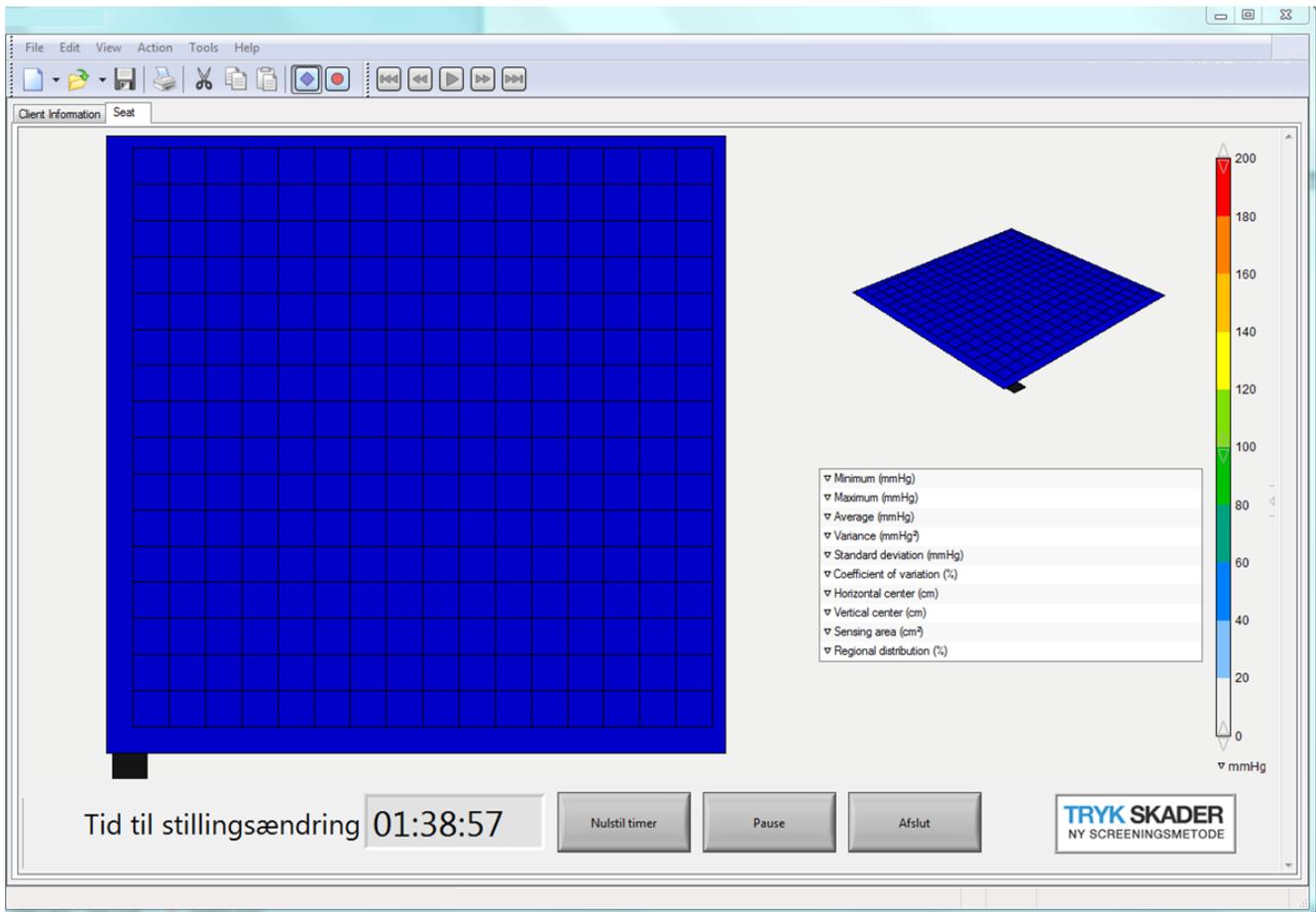
Figure 4 GUI with the timer in action on top of the XXX software, though without pressure data shown.

5.1 Flowchart

The flowchart in Figure 5 gives an overview of the LabVIEW application and the dependencies in the software. For further details the source code of the application should be reviewed.
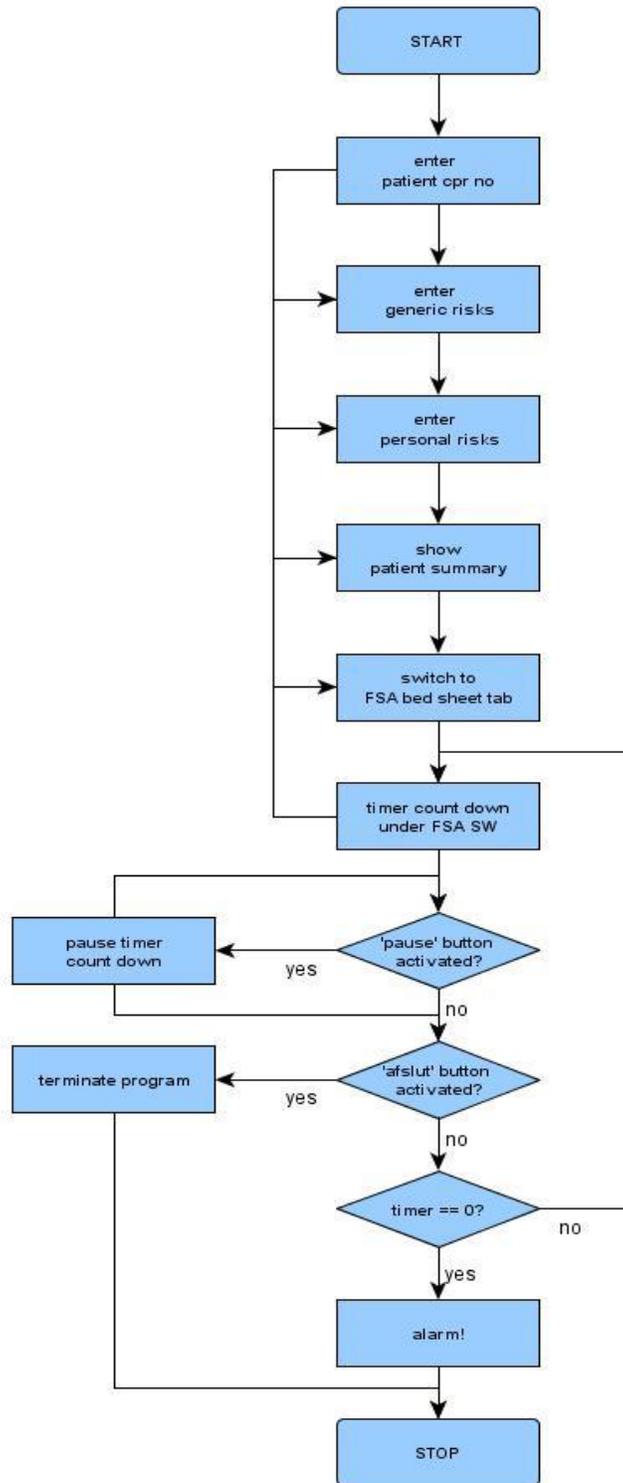
Figure 5 Flowchart of the LabVIEW application

6 Appendix A

6.1 System evaluation

The functionality and principles of the system as a whole has been demonstrated for relevant interest groups ranging from the steering committee to daily users at the hospital and staff at the home care sector. I.e. both the pressure mapping functionality, the implemented screening tool and the alarm functionality were demonstrated on a relevant ward at Skejby Sygehus.

The new features of the XXX system, the screening tool and the alarm functionality, is implemented in an intuitive and easy-to-use way minimizing the risk of mistakes during daily use. The project aims at demonstrating the principles of the system and no further effort has been performed on further perfection of the system including extensive test and debugging.

As such, the aim of the project is reached with the demonstration and future aspects are discussed in the section below.

6.2 Future aspects

As mentioned above the alarm system is immature seen from a commercial point of view and additional effort should be added in order to distribute the system to wards and/or hospitals of interest.

The immediate response from the demonstration sessions showed a high degree of enthusiasm about the system and the possibilities. Based on these positive reactions an exploitation of the monitoring and alarm system seems to benefit on the time spent on the daily care taking routines of the patient and in addition to that give a higher degree of patient safety due to the alarm sent directly to the relevant nurse.

The next step in system exploitation might be a development iteration of the whole system to raise the mature level and to initiate the relevant documentation and application process with the relevant authorities for approval as a medical device. Thereby further user inputs and feedback from the clinical use can be acquired to improve the system.