

Long-Time Experience with a Dedicated Database for a Chest Pain Observation Unit

T Hilbel^{1,2}, D Lossnitzer¹, R Tesarczyk¹, HA Katus¹, E Giannitsis¹

¹Division of Cardiology, University of Heidelberg, Heidelberg, Germany

²University of Applied Sciences Gelsenkirchen, Gelsenkirchen, Germany

Abstract

Chest pain observation units (CPU) are specialized emergency units for the optimal medical management of patients with acute chest pain. Electronic data collection in the CPU must reflect the rapid patient access and emergency treatment pathways in the CPU. Therefore a dedicated relational database was developed for the CPU. The specialized database reflected the clinical pathway of a chest pain patient from admission to discharge. All clinical data can be inserted in symptom orientated database forms. During structured data input, the database calculates several symptom related risk scores. The 12 channel ECG is sent by wireless transmission to the database. All clinical laboratory blood values are sent immediately using a HL 7 software interface. The general experience with the symptom and clinical pathway orientated dedicated CPU database confirms that it provides optimal support for the clinical triage and initial treatment tasks in a specialized emergency CPU.

1. Introduction

Chest pain observation units are specialized emergency units for the optimal medical management of patients with acute chest pain [1,2]. The objectives of chest pain observation units are to rule out heart disease or to rapidly diagnosis and provide emergency treatment of acute life threatening heart disease including myocardial infarction, acute coronary syndromes, arrhythmias or other life threatening cardio-pulmonary emergencies. Chest pain observation units as a subunit of the emergency department or as a separate emergency ward were developed within the last two decades in the United States of America and are now part of many medical centers [3,4]. In contrast to the United States, the first chest pain units in Germany were opened about five years ago. The chest pain observation unit at the Heidelberg University Medical Center was opened in June 2004. The Heidelberg University Hospital normally

prefers to use one global clinical information system for patient administration, patient clinical care and patient reporting. Soon after deployment of the Heidelberg chest pain observation unit it was realized that the existing data workflow within the global clinical information system was suboptimal to manage the rapid patient access and emergency treatment pathways in the chest pain observation unit. Therefore a dedicated relational database was developed for the chest pain unit. The specialized database serves as a future prototype for the global clinical information system and reflects the clinical pathway of a chest pain patient from admission to discharge.

2. Methods

The database server platform for the dedicated chest pain unit database is Filemaker server 10 advanced® hosted on a computer running MS Windows Server 2003®. The Filemaker® platform was chosen to build a flexible database prototype for rapid deployment and also instant web publishing. The database clients in the chest pain observation unit access the database server using the Filemaker® client software versions 8.0, 8.5, 9.0 or 10. A wireless tablet PC within the chest pain observation unit does access the database server using a web explorer. In addition, study nurses also have simultaneous access to special study related research data in the database. The database is Windows® and OS X® compatible. Beside Windows OS® users also Mac OS® users have access to the database when they use the appropriate Filemaker® client software. Linux users can access the database using a web explorer.

3. Results

A software connector to the global clinical information system provides sharing of data for patient admission. In general the doctor initiates the database input from the database worklist window. The worklist window displays all patients in the chestpain unit and has a horizontal bar

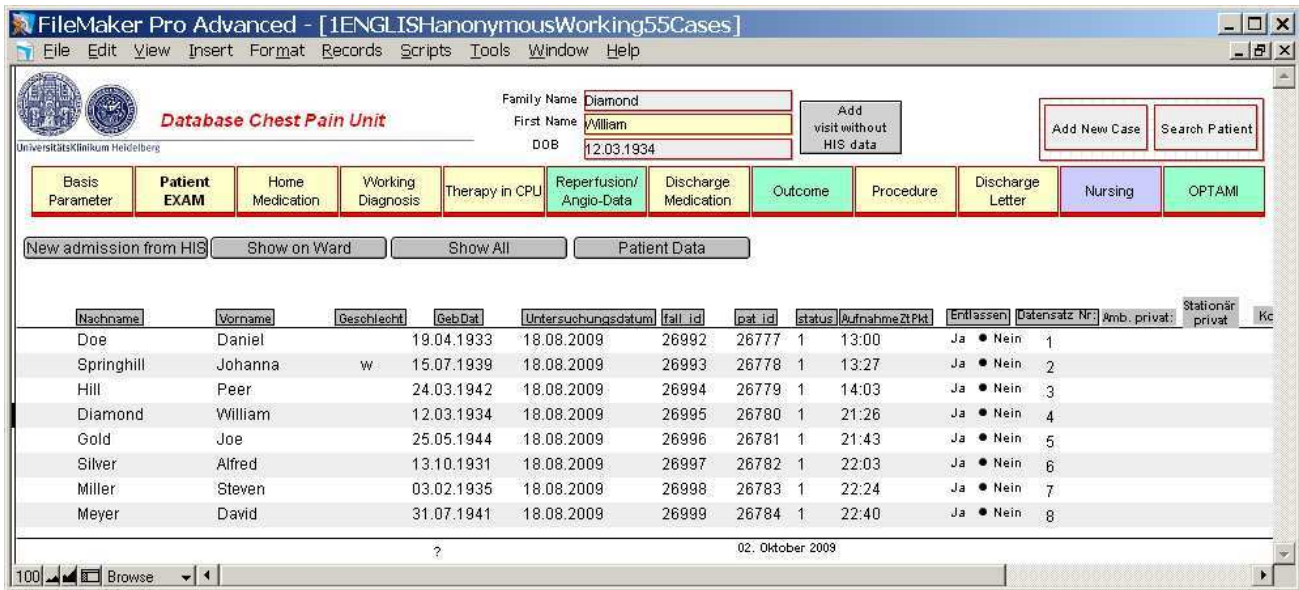


Figure 1. This picture depicts the worklist window of our database. The rectangle buttons with red borders reflect a treatment orientated navigation pathway from left to right.

with navigation buttons above the patients' worklist (Figure 1). The horizontal bar with its buttons is the database main navigation level. It reflects the workflow for data collection while the patient is treated in the chest pain unit from left to right. The first button on the left is annotated 'Basis Parameter'. A click on this button opens the first database window for the input of the vital signs, a general survey, anamnesis, chief complaints, present illness, past history and known cardiovascular risk factors like diabetes, hypertension, smoking status and others. The second main navigation button for data input is called 'Patient EXAM'. When this button is clicked a new set of vertical navigation buttons are displayed. The vertical buttons on the left give access to the different input masks of the selected workflow level. To enter the physical examination the doctor has to click on the vertical button labeled 'Physical EXAM'. To see or enter the data for findings from instrumental exams the user has to click on the vertical button labeled 'Instrumental Examination'. A submenu of the instrumental examination register boxes is the patients ECG. The 12 channel ECG is sent by wireless transmission to a fileserver. The database can open the patient ECG in a PDF viewer (Figure 2) when the user clicks a http link. The third vertical button in the 'Patient EXAM' level is labeled 'Lab Results'. On the data form from the 'Lab Results' level all clinical laboratory blood values are displayed. The clinical laboratory blood values are sent immediately to the database using a HL 7 software interface in conjunction with a XML conversion program. Then Filemaker is then able to import XML files with the

laboratory values. The next main navigation level from the left is 'Home Medication' for the structured input of the patient's medication including name, dose and frequency of use. After this the patient's data with its chief complaints, his history and its examination results are collected the selection of a working diagnosis is next. After a click on the 'Working Diagnosis' button the physician will get a choice of possible working diagnosis represented by a vertical row of navigation buttons. Each working diagnosis has its dedicated database mask and will show only relevant fields. The working diagnosis coronary heart disease has other input fields than the database mask for a rhythm event (Figure 3). The clinical data for a working diagnosis can be inserted in symptom orientated forms. During structured data input, the database can calculate several symptom related risk scores such as the Grace Score, the CSS Angina Class, the Braunwald ACS Class, the TIMI Risk Scores for STEMI and NSTEMI, the Killip Class (Figure 4). Further main navigation levels from left to right are 'Therapy in CPU', 'Reperfusion and Angiography', 'Discharge Medication', 'Outcome', 'Procedure', 'Discharge Letter', 'Nursing' and 'Optami'. The nurses have a specialized form for the input of all vital physiological parameters (heart rate, blood pressure, oxygen saturation etc.). At the end of the patient visit, an automated patient discharge report is generated consisting of all inserted clinical and diagnostic information obtained during the chest pain stay. A software connector sends the discharge letter to the hospital information system. Beside mandatory structured input fields all database masks also have free

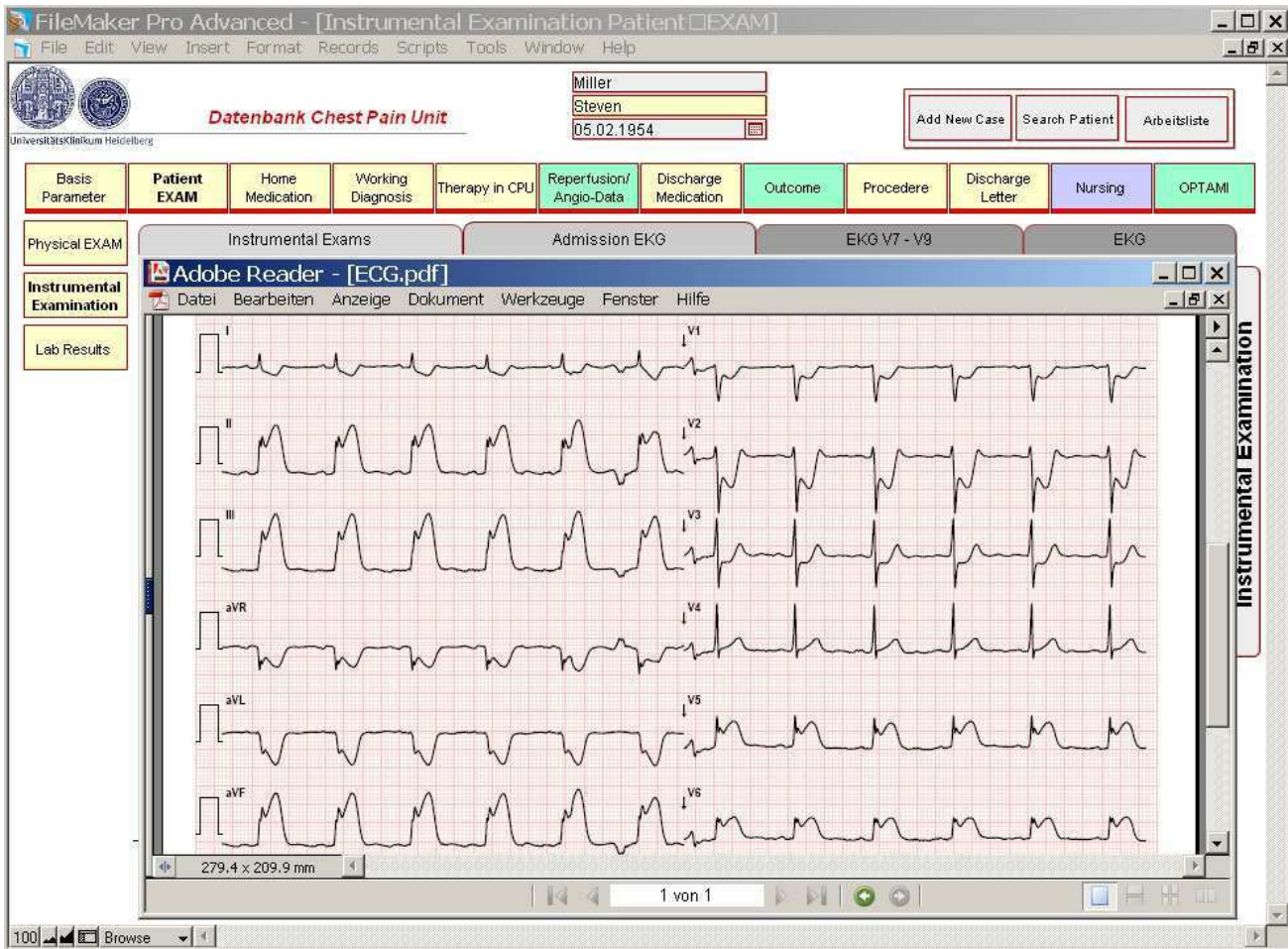


Figure 2. This picture depicts the ECG viewer. A http link stored in the database can open the patient's ECG in a PDF viewer.

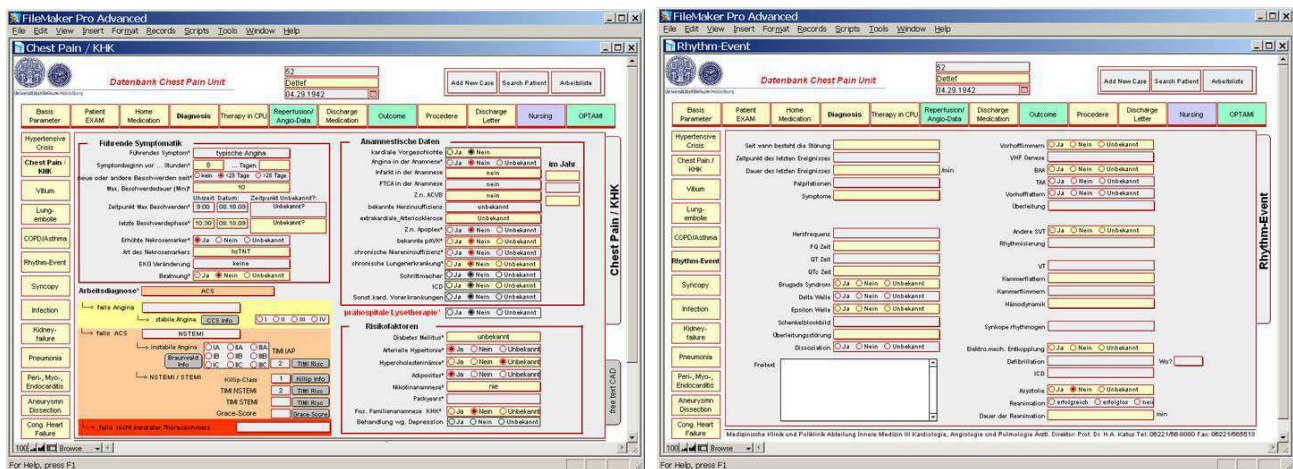


Figure 3. This picture depicts different symptom orientated database masks. The left database mask is for the patients with chestpain and probable cause of coronary heart disease. The database mask on the right is appropriate for a patient with an arrhythmic event.

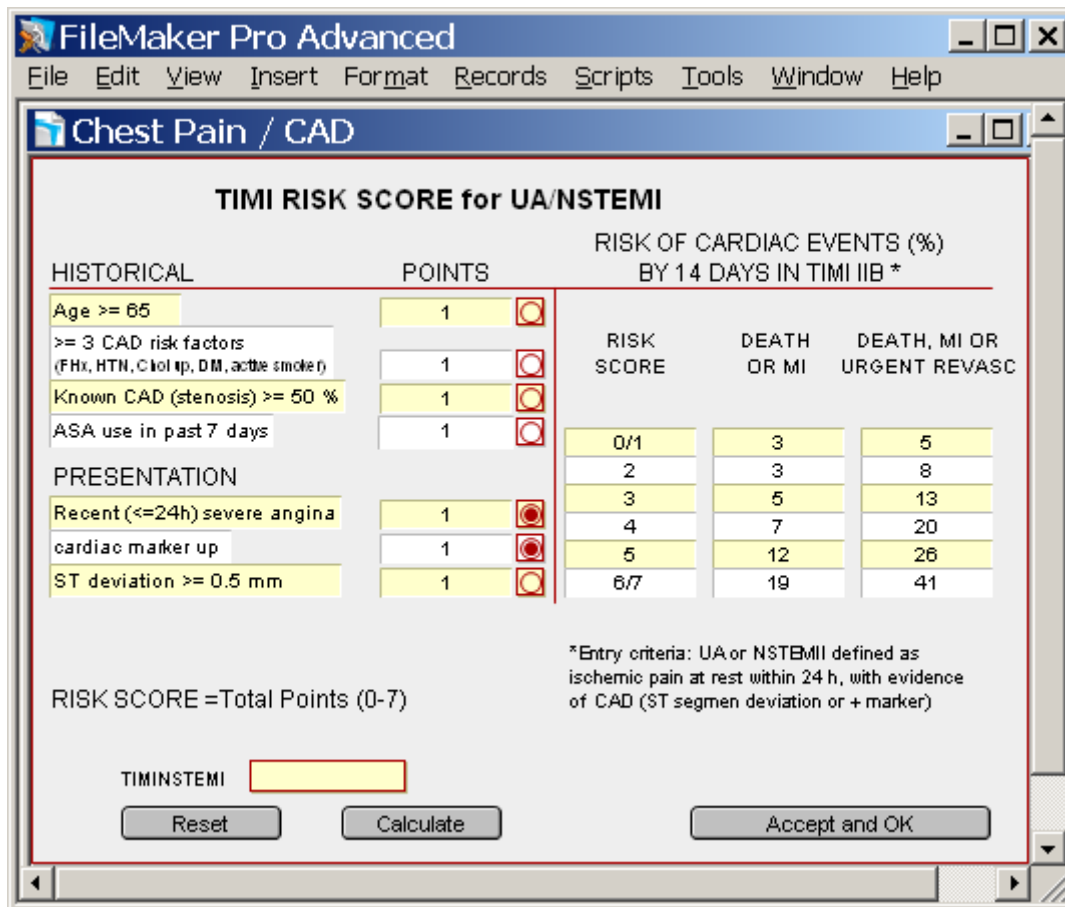


Figure 4. This picture depicts the risk calculator dialog window to calculate the TIMI risk score for unstable angina or NSTEMI. After marking the appropriate risk factor the risk score will be calculated for the patient in the chest pain unit.

text and comment input fields. For data queries, research analysis and quality analysis it is beneficial to have as much structured data input as possible.

4. Discussion and conclusions

From May 2005 to August 2009, approximately 24000 patients visits were entered into the Heidelberg chest pain database. The general experience with the symptom and clinical pathway orientated dedicated chest pain unit database confirms that it provides optimal support for the clinical triage and initial treatment tasks in a specialized emergency chest pain unit.

References

[1] Braunwald E, Antman EM, Beasley JW et al.. ACC/AHA guidelines for the management of patients with unstable angina and non-st-segment elevation myocardial infarction: A report of the american college of cardiology/american heart association task force on practice guidelines (committee on the management of patients with unstable

angina). JACC 2000;36:970-1062.

- [2] Breuckmann F, Post F; Giannitsis E; Darius H; Erbel R; Görges G; Heusch G; Jung W; Katus H, Perings S, Seneges J, Smetak N; Münzel T. Criteria of the German Cardiac Society – cardiovascular research for Chest Pain Units. *Kardiologie* 2008;1 – 6.
- [3] Storrow AB, Gibler WB. Chest Pain Centers: Diagnosis of Acute Coronary Syndromes. *Ann Emerg Med.* 2000;35:449-462.
- [4] Goodacre SW, Morris FM, Campbell S, Arnold J and Angelini K. A prospective, observational study of a chest pain observation unit in a British hospital. *Emerg Med J.* 2002;19:117-121.

Address for correspondence

Thomas Hilbel MD
 University of Heidelberg, Division of Cardiology
 Im Neuenheimer Feld 410
 69120 Heidelberg, Germany
 thomas.hilbel@med.uni-heidelberg.de