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Emergency Medicine on the Threshold of the Digital Age

Emergency Medicine

European legislation governing the medical profession requires that all relevant medical events related to the treatment of patients are chronologically logged. For this reason, emergency medical teams use a log to record medical events. This information is currently recorded by hand, usually on the journey to hospital or once the patient is transferred to the trauma room. This practice may create information deficits, for example, when the timesof medically relevant events are logged in the wrong sequence on the written log. These types of errors, though unintentional, may violate the doctors' legal duty to keep records or be construed as negligence.

This approach seriously impairs the emergency physician's ability to properly prepare the patient for admission to hospital at the accident site and to alert the receiving hospital and provide it with the information it requires to prepare the necessary therapeutic interventions. Given the time critical nature of the emergency physician's role, deficiencies like this can impact on the quality of patient care. Figure 1 shows the current sequence of an emergency intervention, which in this case moves chronologically and unidirectionally from the accident scene through to hospital admission.

The CANIS Research Project

The CANIS research project was initiated in Austria in August 2005 as part of the FH Plus research programme funded by the national research funding agency. The innovative CANIS emergency physician information system has been developed with assistance from the university and industry sources and has benefited from the expert advice of the Carinthian Medical Association.

The CANIS project team, in consultation with its partners, set itself the following objectives:

_ To develop a mobile medical information system to support emergency deployments in order to increase the quality of patient care.

_ To facilitate and optimise the bi-directional, digital and secure information flow between the emergency physician at the scene of the accident and the receiving hospital using GPRS/UMTS (see Figure 2).

_ To develop an integrated IT supported and legally compliant standard for recording all medically relevant events during emergency interventions.

_ To reduce the interval before which necessary therapeutic measures commence while, at the same time, increasing the quality of care.

_ To develop scalable system architecture to enable the integration of diverse mobile data recording devices and communications architectures.

_ To enable automatic identification of the emergency physician (RFID/ Health Professional Card) and patient.

_ To enable the utilisation of health cards for patient identification.

_ To facilitate data recording in parallel with early interventions at the accident site using voice recognition technologies.

Figure 1: Sequential and unidirectional deployment of an emergency physician

More than 70 emergency physician protocols in Austria and elsewhere in Europe were evaluated as part of the project to assist in the development of a valid, Austria-wide emergency response data recording system. This Collection of European Emergency Protocols (CEEP) will shortly be made available online at www.fh-kaernten.at/canis.

CANIS Communications Stream

The flow of information between participating systems is an integrative component of CANIS. Figure 3 shows the diverse components within the overall systems landscape. The Emergency Services Call Centre (ESCC) is activated prior to the actual emergency deployment. It receives the emergency call and alerts the emergency medical team. The deployment data are transmitted to CANIS, confirmed or modified by the emergency physician at the accident site and synchronised with the ESCC. The hospital information systems in place in the region, the medical

devices deployed by the emergency team, for example, electrocardiograms or blood pressure monitors, and the electronic health card (eCard) are also system components.

Given that the health card is not considered a legal form of identification in most European countries, data derived from the card and other information integrated within CANIS are not used to confirm the identify of patients. A standardised open interface – health level 7 (HL7) – is mainly used for communications between CANIS and the various systems.

CANIS System Configurations

Given the nature of accident sites, environmental conditions place considerable strain on the hardware deployed, both in terms of stability and outer protection. The CANIS project only deploys so-called "ruggedised devices" which have guaranteed stability features and are water, humidity and dust resistant (MIL-STD 810F, IP65). Transflective displays guarantee excellent ergonomics during daylight hours. A further prerequisite is the availability of all necessary mobile communications components, including GPRS, UMTS and Bluetooth. Ruggedised devices currently deployed by the system include the Hammerhead RT Tablet PC and Gotive's PDA H42. These devices are shown in Figure 1, which also features possible system configurations that would appear to be both sensible and practical for emergency deployments within CANIS. Depending on the various deployment scenarios and the onsite requirements of the emergency medical team, different hardware configurations will be required to meet medical needs and support the emergency physician. There is an option to integrate a digital data capturing device within the voice recognition facility using a PDA or tablet PC. This digital pen allows the doctor to record medical data by hand in the conventional way, while simultaneously transmitting the data to the centre via Bluetooth. The emergency physician can select the most suitable electronic solution, taking into account service range and cost structure.
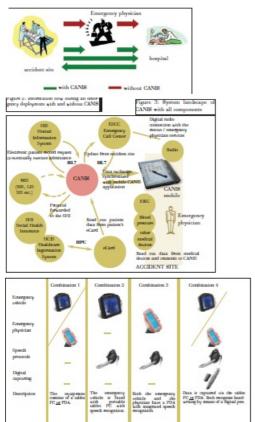

Table 1: Possible system configurations in CANIS HL7 HL7

The CANIS research project will be completed over three phases, each with its own prototype. In Phase 1 the graphical prototype 1 of the mobile client was realised on the basis of a tablet PC (Figure 3). Prototype 2, a fully functional mobile client with secure data transmission, has been undergoing tests at the University Hospital of Graz in Austria since November 2006. Prototype 3 offers options for integrating interfaces and voice recognition and will be tested as part of a benchmark study in Carinthia on completion of the CANIS project in August 2007.
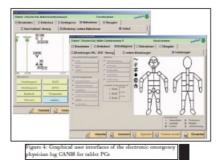

Figure 4: Graphical user interfaces of the electronic emergency physician log CANIS for tablet PCs

Conclusion

The primary function of emergency medical teams is to save lives and minimise harm from injury. The emergency deployment log plays a major role in the performance of this function. It is taken on every call-out and filled in by hand. Unfortunately, in the majority of cases the emergency physician does not have time to enter the relevant medical data or complete the log until the journey to the receiving hospital begins or the patient's transfer to the hospital has been completed.

This prevents key information on the patient's condition from reaching the hospital in a timely manner with the result that its preparations for receiving the patient are sub-optimal and therapeutic measures are delayed.

Digital recording of medical data improves documentation standards in emergency services because the pool of data it generates facilitates qualitative and quantitative controls and focused education and training.

The CANIS research project addresses these challenges from the perspective of the emergency physician and extends from process acquisition to mobile prototypes. CANIS is funded by the Austrian Research Promotion Agency (FFG) under its FH Plus programme and other partners. Further partners, including the University of Klagenfurt, are being brought on board. The CANIS research project will be completed in August 2007.

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