

eHealth Project of the Month Clinicip



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Monitoring patients' glucose levels in Intensive Care Units



Does eHealth contribute to saving lives?

Every year, thousands of intensive care units (ICU) patients across Europe either die or stay sick for longer than necessary. The cause is the fact that many ICUs cannot easily control the glucose levels in each patient's blood. One EU eHealth project may have solved the problem.

Healthcare staff relies on a technique which uses insulin to control the glycaemia of recovering surgical patients. This method is also used to help patients at medical intensive care units to recover faster. "Studies show that when patient's glucose levels are managed carefully, the mortality is reduced and the morbidity is reduced too," says Martin Ellmerer, scientific director of the [CLINICIP](#) project.

Automated insulin delivery

The project hopes to develop an intelligent, automated glucose monitoring and control system for ICUs. It's called 'closed-loop' because monitoring glucose levels and administering insulin would be completed by one self-contained system.

The project is now testing the algorithm, which could be commercialised as a diagnostic support tool.

A closed-loop system needs inputs, analysis and outputs. The CLINICIP partners are developing a system that links glucose measurement to a control unit assessing a patient's needs, and then releases insulin automatically.

They have already developed an algorithm to analyse how much insulin is needed, based on carbohydrate intake and current glucose levels. The team believe they have solved the problem, but it will require long-term validation to get the correct fine-tuning. That algorithm is in trials, and

the partners hope to have initial results early next year.



Internal or external glucose sensors?

The project is also currently studying sensor systems, both intra-vascular and extra-vascular – that is, within and outside the veins. If successful, automated sensor systems could greatly improve the survival chances of intensive care patients. They could also increase efficiency in clinical practice. That, however, is a long-term goal.

The ideal solution would be to use a glucose sensor system outside of the blood vessels. It's less invasive, and evidence suggests that it can provide a very accurate indication of real glucose levels in the blood.

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But first the team must establish that the external sensor is accurate and reliable. The intravascular system is both accurate and reliable, but it is more invasive and time consuming, and not really appropriate for some types of patient such as cardiac arrest victims and infants.

Key recovery technique

Glucose effects blood toxicology, so careful management is essential to keep patients in the best possible health.

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Glucose management is as important for medical and surgical intensive care patients as for diabetic patients. It's also important in paediatric intensive care cases. Intensive insulin therapy helps many different kinds of patient to survive or achieve a better recovery.

It is five years since medical science realised how vital glucose control is to ICU outcomes, but there is still no complete solution to glucose management because of its complexity.

Taking glucose levels manually is time-consuming and the impact of glucose levels varies from patient to patient, as does the dose of insulin required. It's a very complex problem, one that seems to be even more complex in critical illnesses than in diabetes management.

The body interface obstacle

The major obstacle currently facing the project is the body interface, or how the sensor in the body links to the rest of the closed-loop system. Ellmerer says that the team would be interested in hearing from any industrial partners involved in this area.

Even if the body interface problem is solved soon, he believes the full closed-loop system will not be developed within the lifetime of the project, which ends in January 2008. The work will continue however. "There are bilateral agreements between many of the partners to continue the work that we've started here after the life of the project," Ellmerer remarks.

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In the meantime, CLINICIP's algorithm has provoked intense interest among medical scientists, and there have been calls to make the algorithm available to all ICUs.

"But it's just not possible yet. We haven't established definitively that it is sufficiently accurate, reliable and safe," warns Ellmerer. "That assessment is under way now."



Links:

Project website: the closed Loop Insulin for Critically Ill Patients

<http://www.clinicip.org/>

[Clinicip exhibition during IST 2006 conference](#)

Project overview:

CLINICIP fact sheet on CORDIS:

http://cordis.europa.eu/fetch?CALLER=PROJ_IST&ACTION=D&RCN=71227

IST Results feature:

<http://istresults.cordis.europa.eu/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/88771>

Related projects researching in this area:

http://cordis.europa.eu/fetch?CALLER=PROJ_IST&QZ_WEBSRCH=IST-2002-2.3.1.11+QM_EP_PGT_A=&USR_SORT=EP_PJA_A+CHAR+ASC

Health Policy Relevance:

http://europa.eu.int/information_society/activities/policy_link/policy_cases/index_en.htm#Health

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