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'Big data' technique improves monitoring of kidney transplant patients

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A new data analysis technique could radically improve monitoring of kidney transplant patients, according to new research published this week in *PLOS Computational Biology*.

The research, carried out by a team comprising physicists, chemist and clinicians at the University of Leeds, provides a method for making sense out of the huge number of clues about a kidney transplant patient's prognosis contained in their blood.

By applying a sophisticated "big data" analysis to the samples, scientists were able to process hundreds of thousands of variables into a single parameter to indicate how a kidney transplant was faring. This allowed them to predict poor function of a kidney after only two days in cases that may not have been previously detected as failing until weeks after transplant.

These extra few days are vital in the early stages after transplant and would give doctors a better chance to intervene to save the transplant and improve patient recovery periods. In some cases, the team were able to predict failure from patients' blood samples taken before the transplant operation.

Dr Sergei Krivov, in the University of Leeds' Astbury Center, said: "If you put a blood sample through Nuclear Magnetic Resonance analysis you get data down to the molecular level. You can identify chemical fingerprints left behind by specific cellular processes and you get a very

large number of different parameters in those samples that vary with the outcome for a patient.

"These are vital clues. But, if you have got thousands of variables all moving in different ways in a complex system, how does a doctor bring all that information together and decide what to do? It is not possible to do this with the human mind; there are just too many variables. We have to do it with computers and find a way to weigh those variables and produce an intelligible output describing where, overall, the patient is heading."

The study, which analysed data from daily blood samples from 18 patients immediately before and in a week-long period after kidney transplants, showed that it was possible to pick out pieces of information that varied with the overall likelihood of a patient either rejecting a kidney or recovering kidney function.

Given enough data, the technique could even be used to quantify very complex and extended processes affecting the whole population.

More information: Krivov SV, Fenton H, Goldsmith PJ, Prasad RK, Fisher J, et al. (2014) Optimal Reaction Coordinate as a Biomarker for the Dynamics of Recovery from Kidney Transplant. *PLoS Comput Biol* 10(6): e1003685. DOI: 10.1371/journal.pcbi.1003685 .