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Predicting risk in CKD

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Chronic kidney disease (CKD), often leading to a gradual and irreparable loss of renal function, is now common enough to be considered a worldwide public health threat as prevalence of CKD has reached epidemic proportions with 10-12% of the population, and › 50% of elderly, showing signs of kidney disease. Having multiple aetiologies, CKD is defined as a state of kidney damage and/or decreased glomerular filtration that lasts for at least 3 months.

It associates with high risk of mortality due primarily to cardiovascular (CV) disease and infections, progression to end-stage renal disease (ESRD) requiring renal replacement therapy (RRT), that further worsens the prognosis, and high healthcare costs.

Since the beginning of RRT for ESRD, through dialysis or transplantation, the number of patients treated worldwide has increased at an annual global average rate that is far in excess of the growth rate of the general population.

Long relatively unnoticed, the universal ageing of populations, going along with the worldwide trend of increasing body weight, hypertension and insulin resistance in the population has been followed by a similar but delayed increase in CKD.

This increase has also led to an increased awareness, and a common nomenclature developed to facilitate clinical and scientific evaluation. Accordingly, CKD can be divided into five stages depending on the presence of kidney damage, i.e., albuminuria, and loss of kidney function as assessed by glomerular filtration rate (GFR).

Most CKD patients also have other chronic conditions (e.g., diabetes, hypertension) and co-morbidities (e.g., anaemia, bone disease, volume overload) and frequently encounter acute complications requiring immediate action that more often than not could be handled by the patient.

Solutions targeting the prevention or reversal of renal disease and its complications receive widespread attention, but have as yet failed to significantly change the continuous growth of patient numbers. Thus, a superior and financially viable alternative to dialysis or allograft transplantation for ESRD is not foreseen for the near or even mid-term future.

From the results of large cohort studies it is clear that CKD is a heterogeneous condition and those outcomes in regard to progression to ESRD and death vary markedly, depending on baseline characteristics. It is, therefore, critical that the approach to managing CKD patients includes an assessment of the individual's risk of CKD progression, as well as CV risk. Risk communication to patients may motivate them for lifestyle modification and adherence to prescribed therapies. In addition, using models for predicting progression of CKD and CV risk, clinicians may be able to tailor disease-modifying therapies, as well as frequency of monitoring to individual risk. Moreover, using CKD progression models to identify patients who are most likely to need RRT would allow patient education earlier.

It is recognized that risk prediction tools for CV events developed for the general population tend to underestimate the CV risk in patients with CKD.

In addition, no risk model has been extensively validated in different populations regarding CKD progression and it is unclear how knowledge of phenotypic factors can be used for a particular patient with CKD to determine the likelihood of requiring RRT or of dying within the next few years.

Therefore, instruments designed to predict ongoing and future complications, in particular CV events, infections, nutritional deterioration, and renal function decline and to assist CKD patients in shared decisions with their health care providers will be of great value.

Shared decision making consists of patients and providers establishing an ongoing partnership in exchanging information, deliberating on options, deciding upon the priority for taking action and acting on the decision. Though initially developed for use in acute care contexts, such as computer assisted emergency department medical triage, it has recently been adapted for use in chronic care settings, namely diabetes.

Patient decision aids facilitate processes of shared decision-making between patients and their clinicians by presenting relevant scientific information in balanced, understandable ways, helping clarify patients' goals, and guiding decision-making processes.

Unlike more general health education materials, such as information leaflets, decision aids specifically support decision-making by making the decision explicit, providing balanced information on benefits and harms of options, and helping patients clarify what is most important in their own circumstances.

To imitate the complex human reasoning mechanism, intelligent systems that combine a myriad of methodologies, each one addressing a particular task (e.g., pattern mining, prediction, classification, decision support) are already being developed. For instance, Artificial Neural Networks algorithms (ANNs) were developed to predict graft and recipient survival after kidney transplantation[1]. A subset of relevant features from the recipient (e.g., demographics, physic, glycaemia, history of hypertension), the donor (living/cadaver, demographics and physic) and the transplantation (number of matched HLA antigens, cold storage time, and procedure type) was used as inputs.

I believe that tools designed for detecting emerging problems, predicting more precisely the risk of near and future complications and assisting CKD patients in shared decision-making with their health care providers will contribute in the near future to improve self-care, patient outcomes and quality of life. For this purpose, the use of computer and mobile applications will allow improved communication between patients and health care providers. Today most patients increasingly own the necessary resources and equipment that has the potential to be used for this purpose in a way that was unexpected just a few years ago. The incorporation of telemedicine to support self-care will feature medicine for years to come.

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References

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