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AN EXPERT SYSTEM TO ENHANCE PATIENT SELF-MANAGEMENT OF FLUID INTAKE

Hypothesis / aims of study

It is not unknown for patients to be referred to consultant urologists to find that fluid management is the first thing required. Even referrals for uroflowmetry and pressure-flow studies have been encountered by the author, when the first issue to be managed was the patient's intake of fluid, particularly in terms of volume, timing and caffeine intake.

This project aims to develop a computerised, easy-to-use, evidence-based system to give personalised advice on fluid intake, in order to assist self-management of fluids.

Study design, materials and methods

Published evidence on fluid intake requirements (1), fluid modification effects (2) and on issues affecting overactive bladder (3) and nocturia symptoms were considered. The recommendations from the European Association of Urology (EAU), the International Consultation on Incontinence (ICI) and the European Food Safety Authority (EFSA) were also referred. Furthermore, data on activity levels, ambient temperature and body weight have been published (1) and can be used in order to gauge what intake levels are appropriate for a given patient. 'Red flag' indicators are used to screen out symptoms or pathologies that need immediate medical advice. Food is considered to include 20% of daily fluid intake, in accordance with US Institute of Medicine data (1), since it is impractical for the system to assess more precisely the amount of fluid taken in through food. Age is not considered, as EFSA recommendations do not vary with adult age. There is no reference for the precise amounts of caffeine or alcohol that affect patients' lower urinary tract symptoms, but it was noted that the EAU guidelines confirm an effect of some degree.

Consultation with patient groups and continence advisors has informed system development. User testing with 8 volunteers using a paper-based mock-up of proposed screens assessed usability of the system and acceptability of the format.

Results

An algorithm has been developed that takes all the published data into account, compares it with the patient data entered and generates recommendations on fluid management. Table 1 lists the patient input fields and published criteria used in the algorithm.

A paper-based prototype system has been tested with 8 potential users of the system. The user testing found significant promise for the system in three areas:

- System usefulness. All participants agreed the system would provide a useful tool in the pro-active management of bladder problems related to fluid intake
- High level of effectiveness. There were very few instances that users were unable to input their specific data into the system
- Advice. All participants agreed that they would follow advice generated by the system, if accurately tailored to their situation

Patient entered information	Criteria for decision rule set
Volume of fluid intake Time of fluid intake Frequency of urination Level of activity (i.e. sweating) Ambient temperature Weight & Height Whether a smoker Nature of bladder problem Gender Diet includes caffeine? Diet includes alcohol? Diet includes saccharine?	Fluid intake requirements [1] Fluid intake modification [2] Lifestyle modifications [3] EAU guidelines ICI review EFSA dietary reference values

Table 1. Summary of information entered by the user and the sources of data for system rules

A set of screens allows the patients to summarise their fluid intake (volume, time and type) and urine output in a concise way. An example screen is shown in Fig 1. Information is also gathered on body mass index, smoking, lifestyle and symptoms. Summary advice is then generated by the algorithm, to guide amount of fluid intake, caffeine/saccharine/alcohol content of fluids, timing of drinks, body mass index and smoking, and simple bladder training.

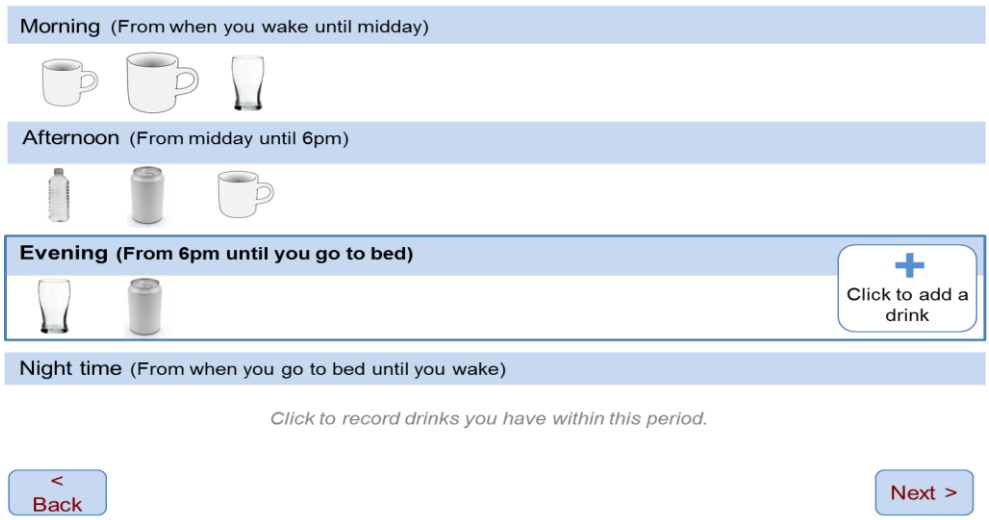

Figure 1. An example screen of the system, in this case the fluid intake screen

Interpretation of results

The system, if available on a website or 'app' could function as a self-managed triage for patients with simple LUTS. As a possible alternative, the recommendations could be reduced to a set of simple, general recommendations for public education on fluid intake. Possible dissemination methods have been suggested as a website, a smartphone app, a leaflet for GP surgeries or an education campaign.

Concluding message

A limited expert system has been developed that has been shown to be acceptable to patients for self-management of fluid intake. This system may be useful in allowing conservative fluid management to be carried out before medical advice is required. The benefits would be quicker resolution of problems, less clinician time required and thus fewer healthcare resources taken up with simple, easily resolvable issues.

References

1. "Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate" US National Academy of Sciences, Washington DC (2004)
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3. Int J Clin Pract. 2009; 63(8): 1177–1191

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