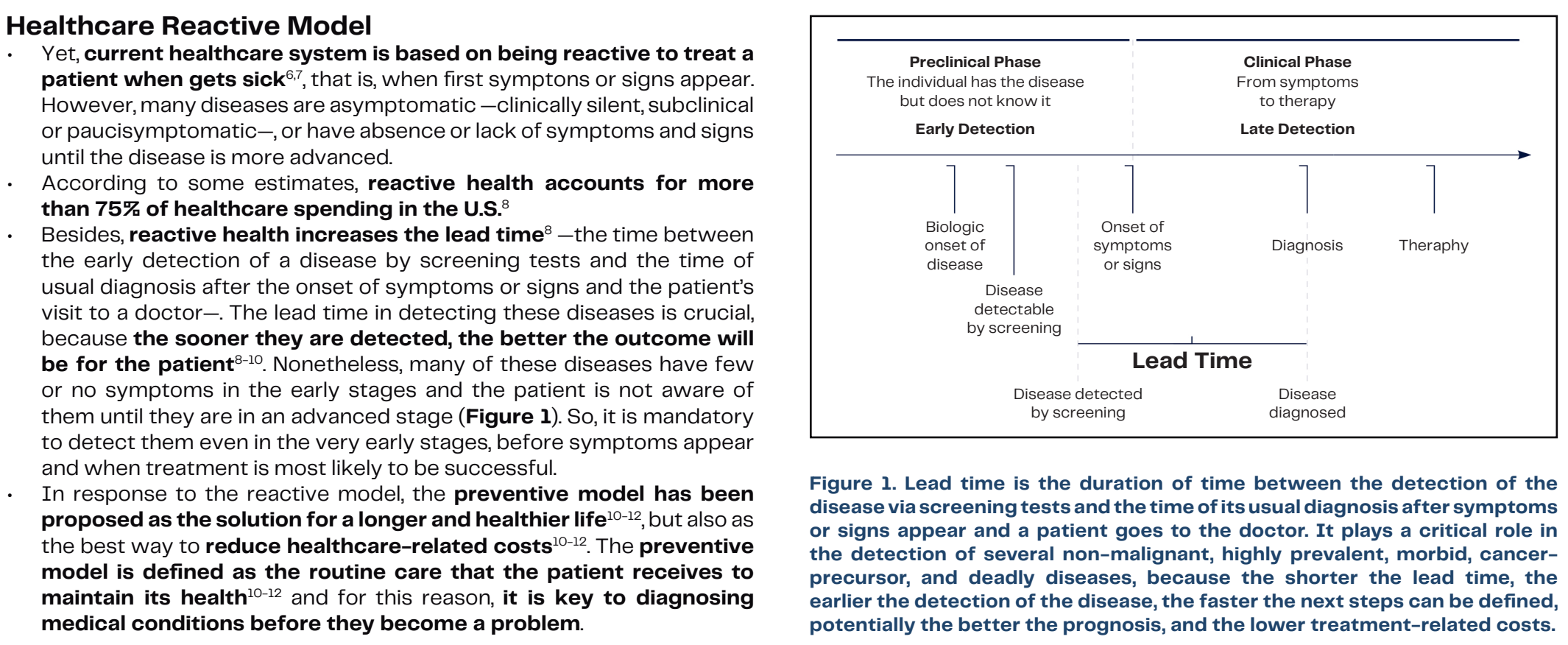


An innovative Evidence-Based Laboratory Medicine (EBLM) Test to Assist Doctors in the Assessment of Hydroelectrolytic Metabolism

Authors: Adrià Roca¹, Sergio J. Calleja², José D. Santotoribio³
Affiliations: ¹Blueberry Diagnostics, Barcelona, Spain; ²Kience, Wilmington, U.S.; ³Hospital Universitario Puerto Real, Cádiz, Spain

Introduction: According to the National Center for Health Statistics (NCHS), there are many diseases whose prevalence is highly concerning...
Background: The prevalence of the main causes of electrolyte imbalance-related diseases—malnutrition, type 2 diabetes mellitus (DM2), and chronic kidney disease (CKD)—in the U.S. as well as their main consequences—osteoporosis, cardiovascular diseases (CVD), and migraine—



Healthcare costs: The high cost of healthcare is a burden on U.S. families...
Chronic, Morbid and Cancer-Precursor Diseases, and Aging: The World Health Organization (WHO) estimates that chronic illnesses account for half of the global disease burden...

Objectives: To define a minimum blood and/or urine—if needed—panel capable of confirming and/or detecting...
Methods: This study was developed as a part of a previous one that has been presented at the European Society for Medical Oncology (ESMO) Congress 2024...

Results: The prevalence of the main causes of electrolyte imbalance-related diseases...
Inclusion Criteria: Men and women with not known currently clinically diagnosed pathologies...
Exclusion Criteria: Patients who do not meet the inclusion criteria or meet any of the following criteria...
Figure 3: Inclusion and exclusion criteria for the selection of the study population, as well as the graphical flow of the patients that were selected in the study population.

Figure 4: Test requisition form (TRF) for the RCT to be performed in the U.S. (Empire City Laboratory Inc., Brooklyn, NY, U.S.).
Table 1: Clinical data, displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.

Table 2: Anthropometric indices and ratios, displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.
Table 3: Raw laboratory data, displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.

Table 4: Selected laboratory data, displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.
Table 5: Hydroelectrolytic scores; displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.

Table 6: Overall sensitivity (Se), specificity (Sp), AUROC, positive predictive value (PPV) and negative predictive value (NPV) results obtained in both the algorithm modeling—training set...
Table 7: Complete results for all patients, being each one a patient. Columns correspond to the following data: clinical data of the patients, a series of body functions and systems, and the Health Score.

Figure 5: Sample graphic for the calcium-to-magnesium (Ca-to-Mg) ratio shared with healthcare professionals to validate the usefulness of this new approach to routine blood test...
Figure 6: Sample graphic for the calcium-to-phosphate (Ca-to-P) ratio shared with healthcare professionals to validate the usefulness of this new approach to routine blood test.

CONCLUSIONS: This innovative non-invasive blood-based biomarker algorithm holds promise in providing timely and accurate assistance to doctors in the assessment—as well as screening—of electrolyte imbalance-related diseases...
Table 8: Lifestyle habit—and processed meat consumption (displayed as frequency), fruits and vegetables consumption (displayed as serving), physical activity (displayed as level), smoking habit, and drinking habits (displayed as standard drink units), for all patients.

Acknowledgments: This study was supported by Biognosis and Blueberry Diagnostics. Funding support was provided by 2x2 Proooms team...
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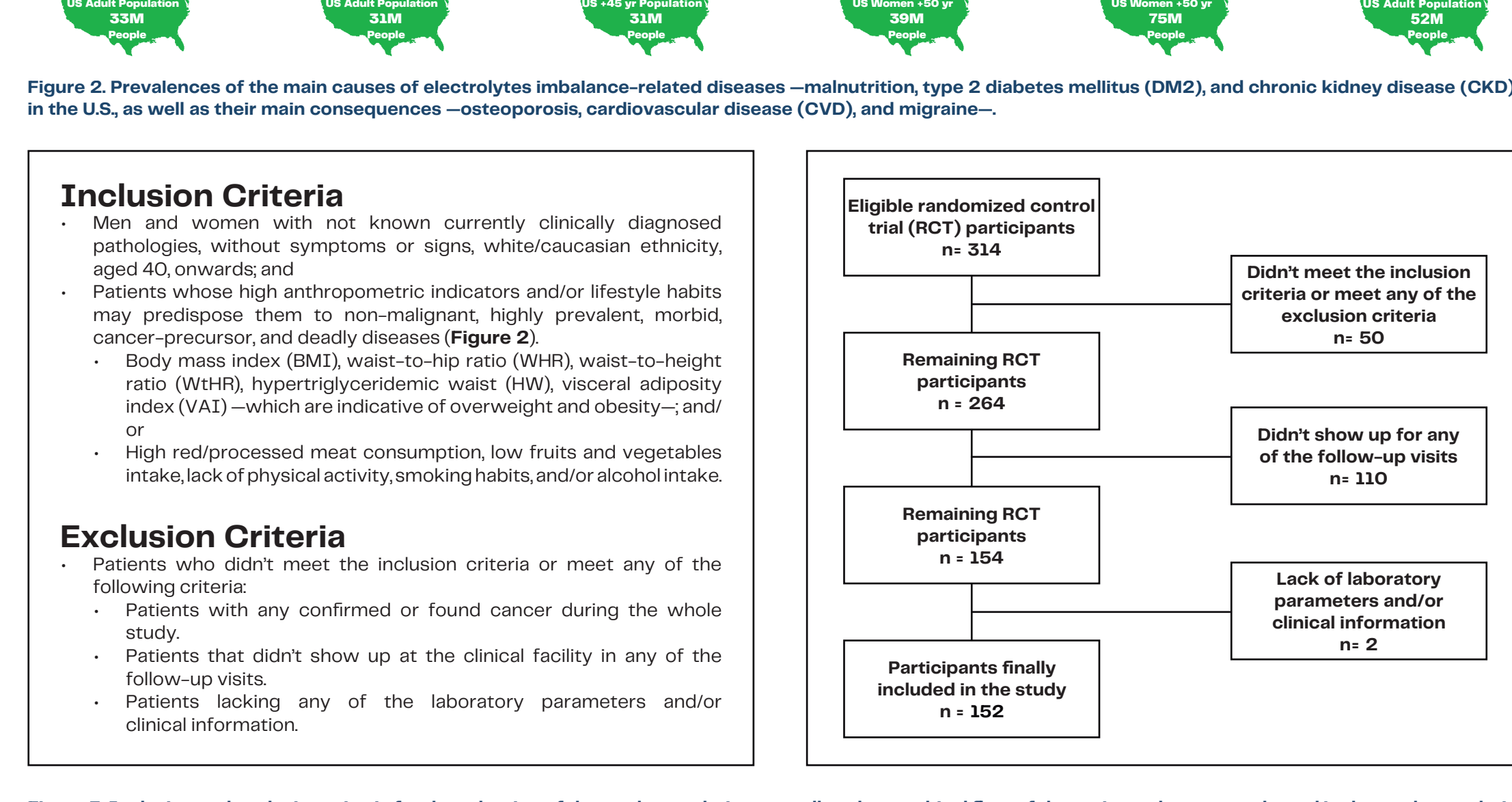


Figure 3. Inclusion and exclusion criteria for the selection of the study population, as well as the graphical flow of the patients that were selected in the study population.

Table 4. Test requisition form (TRF) for the RCT to be performed in the U.S. (Empire City Laboratory Inc., Brooklyn, NY, U.S.). This new RCT will be based in a sample size (n) of 1,000 participants—paying special attention to different ethnicities of the population of the U.S.

Table 1. Clinical data, displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.

Table 2. Anthropometric indices and ratios, displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.

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Table 5. Hydroelectrolytic scores; displayed as the mean value of each parameter with the corresponding minimal (Min) and maximal (Max) value, for all patients and by gender: male and female.

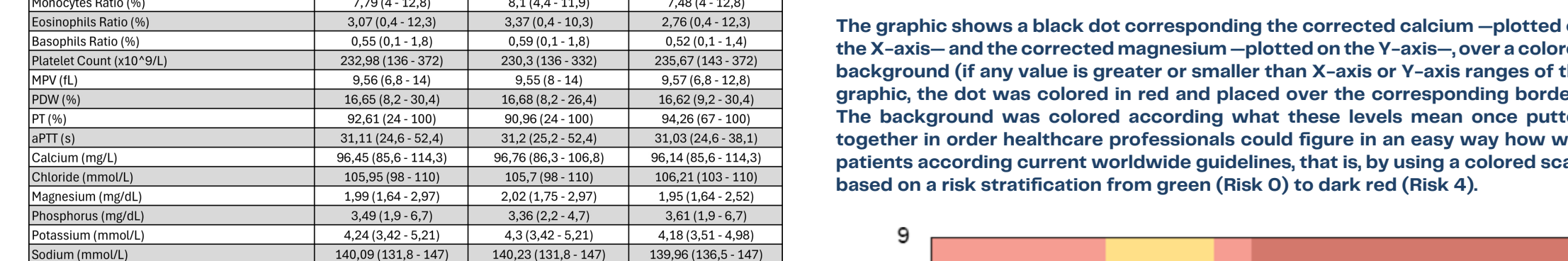


Figure 5. Sample graphic for the calcium-to-magnesium (Ca-to-Mg) ratio shared with healthcare professionals to validate the usefulness of this new approach to routine blood test—diagnostic accuracy, non-invasiveness, time savings, cost savings, turnaround time for results, ease of interpretation of results, or savings on additional complementary tests, among others—.

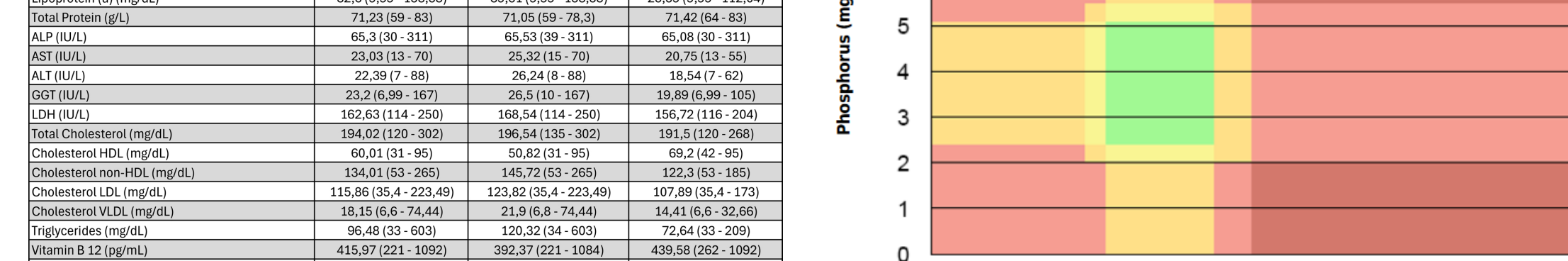


Figure 6. Sample graphic for the calcium-to-phosphate (Ca-to-P) ratio shared with healthcare professionals to validate the usefulness of this new approach to routine blood test.

The graph shows a white dot corresponding the corrected sodium—plotted on the X-axis—and the potassium—plotted on the Y-axis—, over a colored background (if the value is greater or smaller than X-axis or Y-axis ranges of the graphic, the dot was colored in red and placed over the corresponding border).

The graph shows a white dot corresponding the corrected sodium—plotted on the X-axis—and the potassium—plotted on the Y-axis—, over a colored background (if the value is greater or smaller than X-axis or Y-axis ranges of the graphic, the dot was colored in red and placed over the corresponding border).

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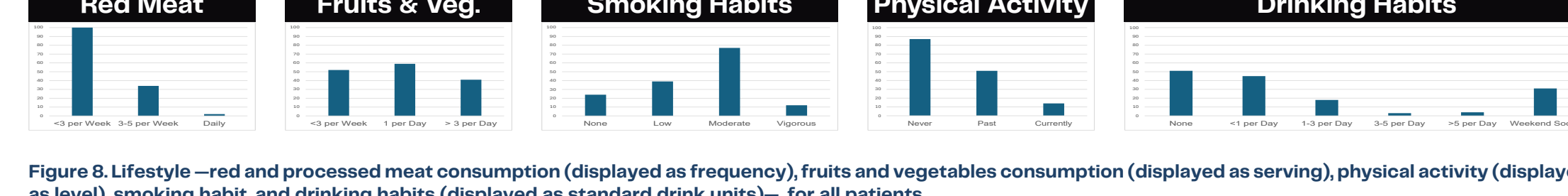


Figure 8. Lifestyle habit—and processed meat consumption (displayed as frequency), fruits and vegetables consumption (displayed as serving), physical activity (displayed as level), smoking habit, and drinking habits (displayed as standard drink units), for all patients.

RESULTS: This new approach to a routine blood test has detected all the cases of electrolyte imbalance-related diseases—hypercalcemia, hypocalcemia, hyperkalemia, hypokalemia, hypermagnesemia, hypomagnesemia, hypophosphatemia, hypophosphatemia, hyperkalemia, hypokalemia, hypernatremia, or hyponatremia—in the randomized controlled trial (RCT) validation set, as can be seen in Tables 6 and 7.

Given that the prevalence of Haemophilic pylori infection in the raw laboratory data is very low (Table 3), it could be an indicative that the study population was biased. This is because the overall prevalence in Spain is much higher than one achieved in this study¹. Since H. pylori infection is more frequent in people with lower income², this low prevalence in the validation group suggests that the study population is principally composed by middle-to-high class patients, with moderate-to-high income.

In Table 6, the results are displayed for the following group: the training set was tested for all 8 laboratory determinations, but with different providers with their own reference limits and the validation set was tested for the same 8 laboratory determinations, but all of them were performed by the same providers. The sample size (n) of the training set was 2,626 patients, but the union of the providers resulted in a reduction of the sample size, because only those patients tested in Laboratorio Echevarre were used in the validation set, and for this reason, the sample size dropped to 152 patients.

In training set, the sensitivity (Se) and specificity (Sp) obtained were 98.76% and 98.38%, respectively. The estimated area under the receiver operating characteristic (AUROC) curve was 98.06%, and the positive predictive value (PPV) and the negative predictive value (NPV) were 99.38% and 98.78%, respectively (Table 6).

Finally, in validation set it can be seen that false positives (FP) and false negatives (FN) were totally eliminated, and it is also the Se and Sp, as well as the PPV and the NPV, increased to 100.00%. It can be inferred that the sample size (n) was very low (152 patients), and it is so very biased, because all patients were 40 years old and older, white/Caucasian ethnicity, and with moderate-to-high income.

Table 6. Overall sensitivity (Se), specificity (Sp), AUROC, positive predictive value (PPV) and negative predictive value (NPV) results obtained in both the algorithm modeling—training set—as well as in the randomized controlled trial (RCT)—validation set—.

Table 7. Complete results for all patients, being each one a patient. Columns correspond to the following data: clinical data of the patients, a series of body functions and systems, and the Health Score.

Each box is colored according to the result obtained, which is scored from "0" to "4", meaning "0" that the result is highly concerning and requires medical consultation, meaning "4" that the result is very concerning meaning "3" that the result is concerning meaning "2" that the result is not concerning and meaning "1" that the result is normal. BS: blood pressure; AMT: antihypertensive medication; BMI: body mass index; WHR: waist-to-hip ratio; REH: renal function; WVD: hydroelectrolytic metabolism; Ca: corrected calcium; Cr: corrected creatinine; Mg: corrected magnesium; P: phosphate; K: potassium; Na: corrected sodium.

The graph shows a black dot corresponding the corrected calcium—plotted on the X-axis—and the corrected magnesium—plotted on the Y-axis—, over a colored background (if the value is greater or smaller than X-axis or Y-axis ranges of the graphic, the dot was colored in red and placed over the corresponding border).

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