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DIGITAL TECHNOLOGY OF PERSONALIZED ADMINISTRATION OF VITAMIN AND MINERAL COMPLEXES: PRINCIPAL ALGORITHM

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ABSTRACT — This work is devoted to the discussion of our algorithm for personalized selection of the composition of vitamin and mineral complexes using the laboratory parameters of the patient. For this purpose, we have formed a three-stage scheme based on the gradation of a wide range of laboratory indicators and the selection of components depending on whether the values of indicators fall into certain ranges. Given the complexity of analyzing and interpreting this information, the algorithm was implemented as a special computer program, the functionality of which is illustrated in this article.

KEYWORDS — vitamin, mineral, homeostasis, correction, personification, algorithm.

INTRODUCTION

Currently, much attention is paid to vitamin and mineral homeostasis and its maintenance at the physiological level [1, 2, 7]. This is facilitated by both the normalization of metabolism in whole, and the targeted introduction of missing micronutrients and other necessary compounds into the body [1, 5–7]. At the same time, the focus of research and clinical practice in this area is clearly shifted towards the correction of vitamin deficiency. As a result, synthetic and natural mono- and poly-component vitamin preparations are now widely represented on the pharmaceutical market [1–3, 6, 7]. On the contrary, the issue of correcting shifts of mineral, in particular microelement, homeostasis is not fully explained [1, 2, 7]. At the same time, in our previous cohort studies and according to other authors, the prevalence of micronutrient insufficiency is also quite high, reaching 50–60% of the surveyed individuals for individual elements [1, 3, 4]. On the other hand, the profile of shifts in vitamin-mineral homeostasis shows significant individual variations [1, 3, 5, 7].

On this basis, it is appropriate to use a personalized approach to the appointment and composition of vitamin and mineral complexes, which was the ***purpose of this work***.

MATERIAL AND METHODS

To solve this problem, we have introduced a basic three-stage algorithm for preparing individual vitamin and mineral complexes, including the following components:

1) preliminary comprehensive laboratory examination (determination of more than 50 biochemical parameters of blood with an emphasis on indicators that characterize the state of pro- and antioxidant systems, as well as the plasma level of 23 macro-and microelements);

2) analysis of the obtained panel of biochemical indicators and the level of microelements in blood plasma relative to the standards, taking into account the age and gender of patients using our own software developed by Bioniq Health-Tech Solutions Ltd. (London, United Kingdom) and allowing to gradate the level of parameter shifts for the subsequent selection of components of the vitamin and mineral complex;

3) formation of the conclusion about the patient's present metabolic shifts, as well as the individual profile of vitamin and mineral insufficiency. On the basis of this conclusion, a personal complex for course admission is created.

RESULTS

The basis of this algorithm is the analysis of multi-factorial results of laboratory examination of the patient, and the value of each parameter is graded at standardized intervals (from three to seven, depending on the indicator). This gradation allows us to apply a differentiated approach to the choice of dosage or the exclusion of individual components of the complex that compensate for the observed shifts in vitamin and mineral homeostasis. Based on this, a complex network of interactions of parameters and their gradations is formed, which directly determines the composition of the individual complex. The complexity

of the considered algorithm for manual analysis and interpretation predetermined the need for its computerization, which was realized in the development of special software that allows you to automate this procedure and integrate the second and third stages of the algorithm. This makes it possible to objectify and standardize the procedure for analyzing and prescribing individual vitamin and mineral complexes. A part of the functional (internal structure) of the program is shown in Fig. 1 on the example of a fragment concerning ferritin and C-reactive protein. So, low or critically low levels of ferritin or it lower value in conjunction with high or extremely high levels of C-reactive protein suggests the inclusion of three portions of iron and one portion of vitamin C in the complex. On the contrary, the presence of normal or elevated levels of ferritin excludes from the formed complex iron-containing component, and in case of detection of a critically high level, the program provides an urgent notification of the physician.

personal complex, and the effectiveness of its application is controlled by a step-by-step and final laboratory examination of the patient, which is carried out with the determination of the same parameters as in the preliminary testing.

CONCLUSION

Thus, we have formed a three-stage scheme of personalization of vitamin and mineral complexes, based on the gradation of a wide range of laboratory indicators and the selection of components depending on whether the indicators fall into certain ranges. The effectiveness of the complex is evaluated based on the dynamic analysis of this set of laboratory parameters. Given the complexity of analyzing and interpreting this information, the algorithm was implemented as an original computer program which can be used by physicians for evidence-based conclusions.

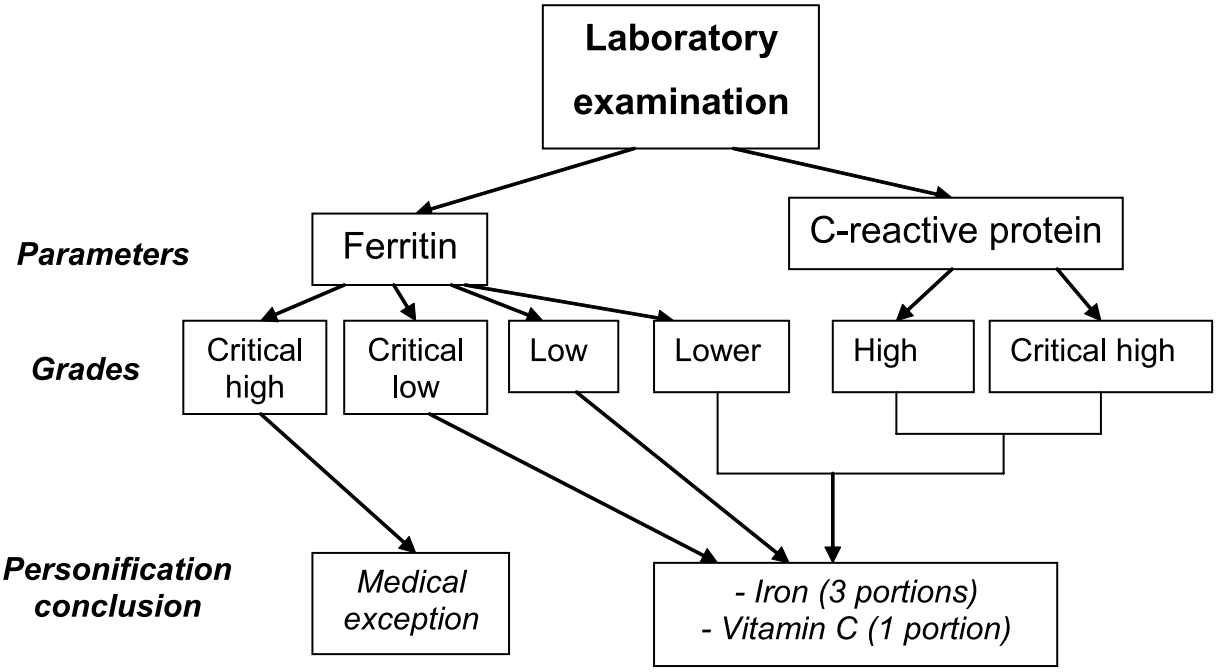

Fig. 1. Fragment of individualization scheme for our vitamin and mineral complex

Software processing of the entire panel of laboratory indicators allows us to make an integrative reasoned conclusion about the totality of the obtained gradations of each parameter and, consequently, the components of the complex necessary for this patient. This information is used for the production of a

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