Leveraging electronic health records may help health systems triage patients for further evaluation in hypophosphatasia

Overview

Hypophosphatasia (HPP) is a serious and rare metabolic bone disease caused by deficient alkaline phosphatase (ALP) enzyme activity.[1] Severe HPP occurs in 1:300,000 births and milder HPP has been reported by some sources to occur in up to 1:6,370 births.[2] The overall incidence or prevalence of all forms of HPP is not known.

HPP has inherent challenges associated with diagnosis.[3,4] A range of perplexing signs and symptoms may appear with varying severity at different ages.[3] Due to the heterogeneity of HPP symptoms, diagnoses are often delayed or missed.[3,4] An analysis of the Alexion-sponsored Global HPP Registry has shown that children experience an 8.4-month median diagnostic delay, and adults experience a 24.5-year median diagnostic delay.[3] Taking action is important. In rare diseases, missed or delayed diagnoses may potentially increase inappropriate management, morbidity, and potentially impact healthcare costs.[5]

Electronic health record (EHR): a resource to triage suspect patients for further evaluation

Leveraging patient-specific information with evidence-based criteria can be used to generate lists of potential HPP patients for further evaluation by HCPs.[4,6,7] The EHR provides a repository of data to which algorithms can be applied to automate the triage of a large set of patients. This may improve efficiency, prioritize resources, lead to more coordinated care, and foster improved outcomes.[8-11] The data necessary to triage suspected HPP patients may already exist in EHRs, such as low age- and sex-adjusted ALP levels and clinical features of HPP.[1,6,12]

While EHR systems may aid in generating lists of suspected HPP patients, it is the sole responsibility of the HCP to make a diagnosis based on in-person clinical evaluation.

EHR in practice: an example[13]

An adult ambulatory care endocrinology practice recently published an approach to identifying potential HPP patients using an EHR. A computerized text search of the EHR was used to identify patients with at least 2 serum ALP levels of ≤40 U/L. Of an estimated 20,000 patient records, 259 (~1.3%) patients were identified as meeting this criteria. The health records of these patients were reviewed by investigators for histories consistent with HPP. Patient information reviewed included osteoporosis information, history of nephrocalcinosis, orthopedic surgery, history of pseudogout, joint pain, history of premature loss of teeth or poor dentition, chondrocalcinosis, history of fatigue, impaired mobility, impaired gait, impaired daily activities, and vitamin B6 levels. The practice did not rule out other conditions that may cause low ALP levels. Of the 259 patients identified as having at least two low ALP tests, ten patients (0.05% of total screened) were identified as having medical histories consistent with HPP. None had been previously diagnosed with HPP or were being treated for HPP. The patient information was manually shared with the patients' respective providers with recommendations to consider further laboratory or genetic testing to confirm a diagnosis of HPP.

DeciphEHR™ approach

The DeciphEHR™ program includes educational materials to help a healthcare organization leverage its EHR to triage suspected HPP patients for further clinical evaluation.

A patient list may be generated in the EHR, typically by an EHR analyst who starts by filtering patient records by persistently low, age- and sex-adjusted ALP levels. Next, the list is filtered by a comprehensive list of clinical inclusion criteria (**Figure 1**). Finally, exclusion filters are applied to rule out other causes of low ALP levels, as shown in **Figure 2**. In addition, a suspect patient list can be used to generate best practice alerts (BPAs) that can be used to alert clinicians to a patient suspected of having HPP. Additional information can be included in a BPA such as a link to information about hypophosphatasia and the patient's relevant laboratory values and clinical history to support the alert. The BPA can also recommend additional substrate testing and genetic testing that may be useful for the diagnosis of HPP.

For more detailed information on the DeciphEHR™ approach, please visit www.deciphEHRrare.com.

Figure 1: HPP Signs and Symptoms[1,14-16]

Skeletal
Bone/joint pain, fractures, rickets, osteomalacia, pseudofractures, osteopenia

Neurologic
Fatigue, headache, sleep disturbances, mood disorder

Dental
Premature tooth loss, abnormal dentition, periodontal disease

Renal
Hypercalcemia, hypercalciuria, nephrocalcinosis

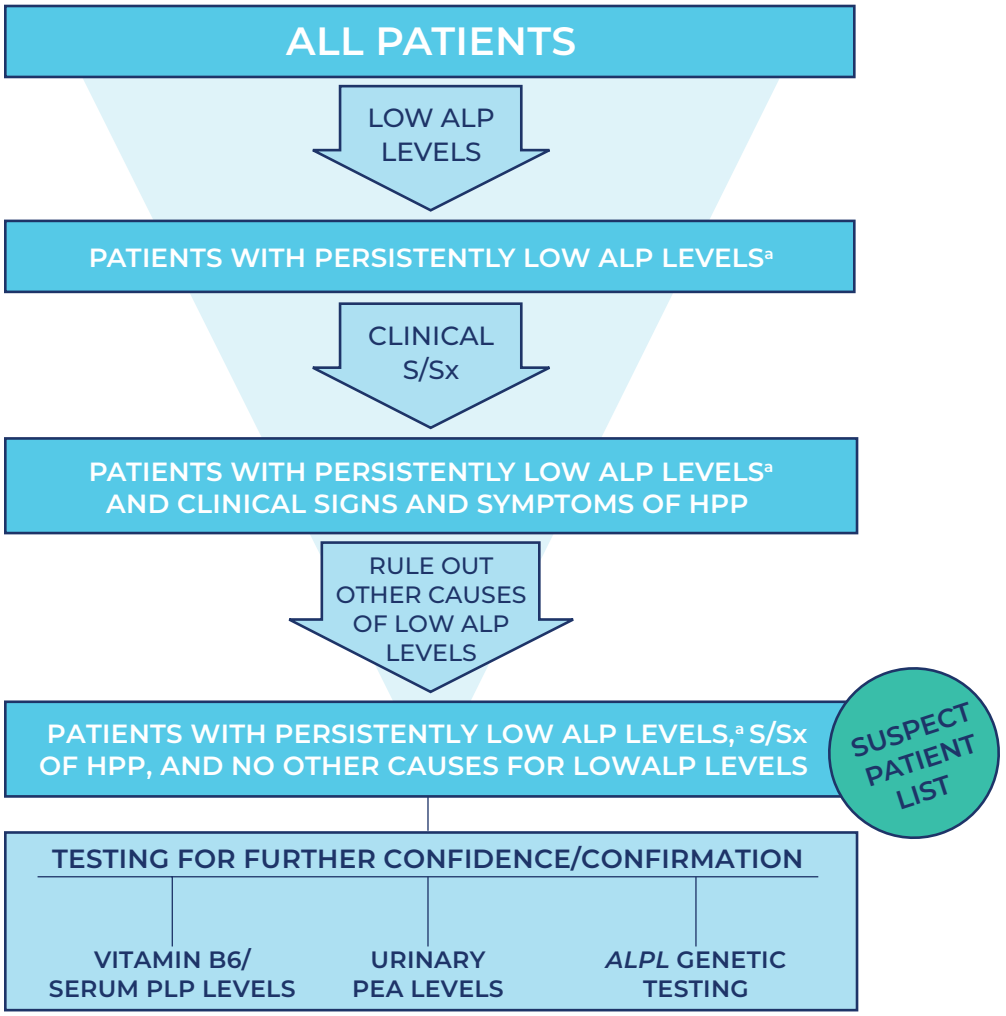
Development/growth
Skeletal deformities, bowing, short stature

Muscular
Muscle pain or weakness, waddling gait, difficulty walking

Respiratory
Rachitic chest, pneumonia

Note: This is not a complete list of possible HPP signs and symptoms. The DeciphEHR™ program includes over 100 adult and childhood diagnostic codes. The complete list can be found at www.deciphEHRrare.com.

Figure 2: DeciphEHR™ Methodology[4,6,7]



All additional diagnostic follow-up must be medically appropriate and determined by the individual decision of the treating HCP.

a. Refer to your lab for appropriate age- and sex- adjusted reference range.
Key: ALP, alkaline phosphatase; **HCP,** healthcare provider; **HPP,** hypophosphatasia; **PEA,** phosphoethanolamine; **PLP,** pyridoxal 5'-phosphate; **S/Sx,** signs and symptoms.

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