PANDA™ - Pediatric Bone Age and Developmental Assessment

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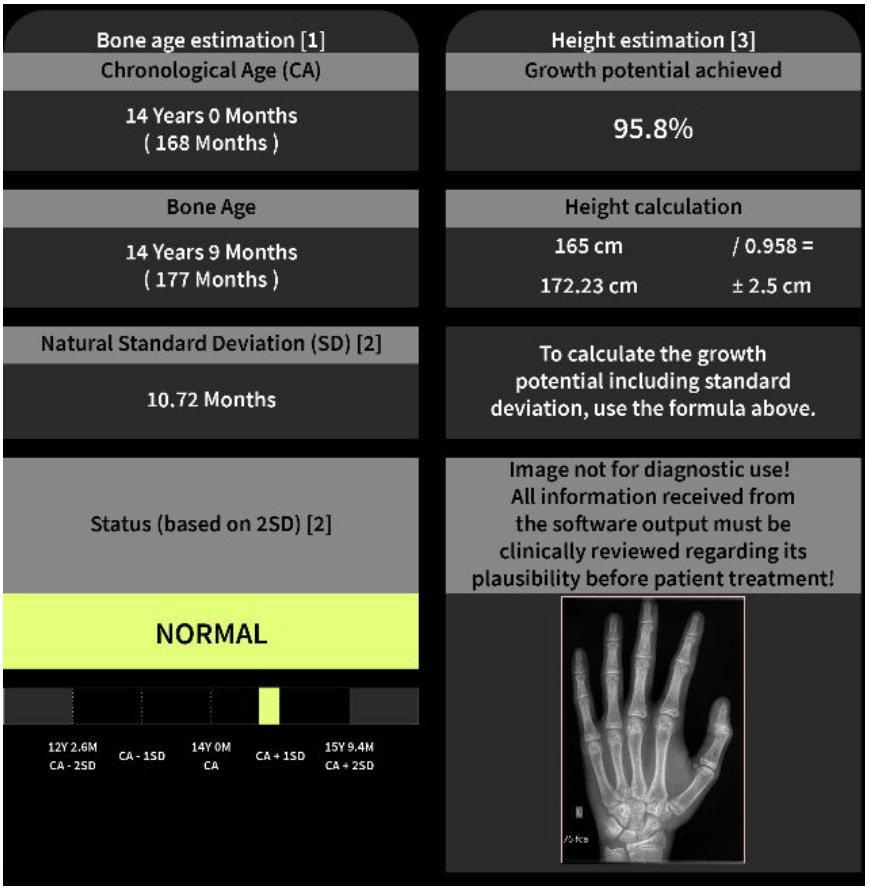
At a glance

Radiographic skeletal age (or bone age) assessment is widely used by pediatricians and endocrinologists as part of the clinical assessment of skeletal maturity. IB Lab PANDA(TM) automates bone age assessment on radiographs of the hand and wrist in accordance with the Greulich & Pyle scale[1] and integrates reporting of bone age, skeletal maturity status and growth potential seamlessly into the radiology reporting workflow.

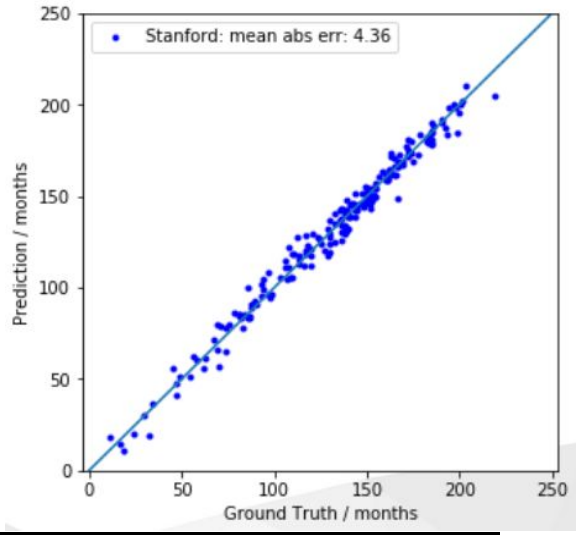


Powered by Artificial Intelligence (AI)

With IB Labs AI trained on over 12,000 hand radiographs[5], IB Lab PANDA uses an ensemble of decision models to report bone age based on the Greulich & Pyle scale. PANDA performance is on par with the top entries to the RSNA Pediatric Bone Age Machine Learning Challenge[2], achieving a minimum absolute deviation (MAD) of 4.3 months on the 200 images comprising the testing dataset from that contest. The CE certified PANDA would come in second place out of 105 submissions and takes less than 5 seconds to compute and report its findings to PACS and RIS on a standard CPU.

Skeletal maturity reporting

IB Lab PANDA reports skeletal maturity status based on standard deviations (SD) of skeletal development established by the Brush Foundation Study[3]. The SD for a given chronological age is determined by *rounding down* to the next age in the Brush table for the appropriate sex. **Advanced** skeletal maturity is reported when the bone age is greater than chronological age by more than 2 SDs, while **Delayed** skeletal maturity is reported when bone age is less than chronological age by more than 2 SDs. Should the clinician deem a patient advanced or delayed based on a different interpretation, the clinician can easily reference the status bar on



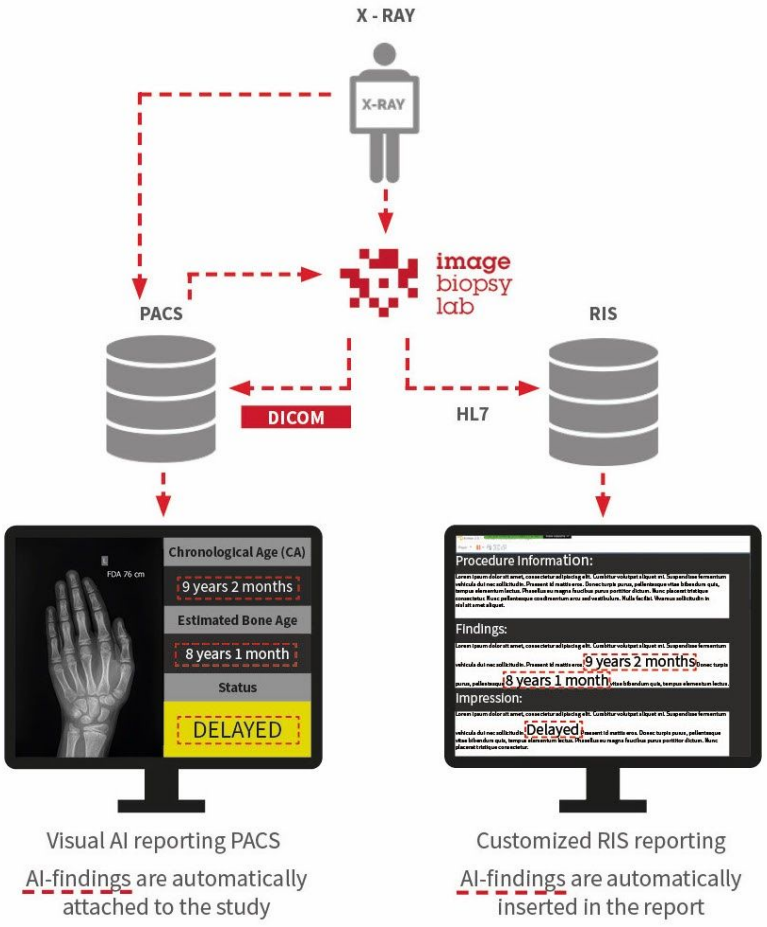
the PANDA report to see where the bone age falls relative to chronological age and Brush Foundation Study standard deviations for a given age.

Growth potential

IB Lab PANDA provides an estimate of growth potential achieved using the **Bayley and Pinneau tables**[4]. To choose the correct table and growth potential, PANDA uses patient sex and skeletal maturity status based on 2SD, and rounds the reported bone age to the nearest available bone age in the appropriate table. From this growth potential, an estimate of adult height is provided. When the patient height is found in the DICOM header, then the height estimate will be provided on the report. Otherwise, the formula for height estimation is provided with instructions on how to perform the calculation.

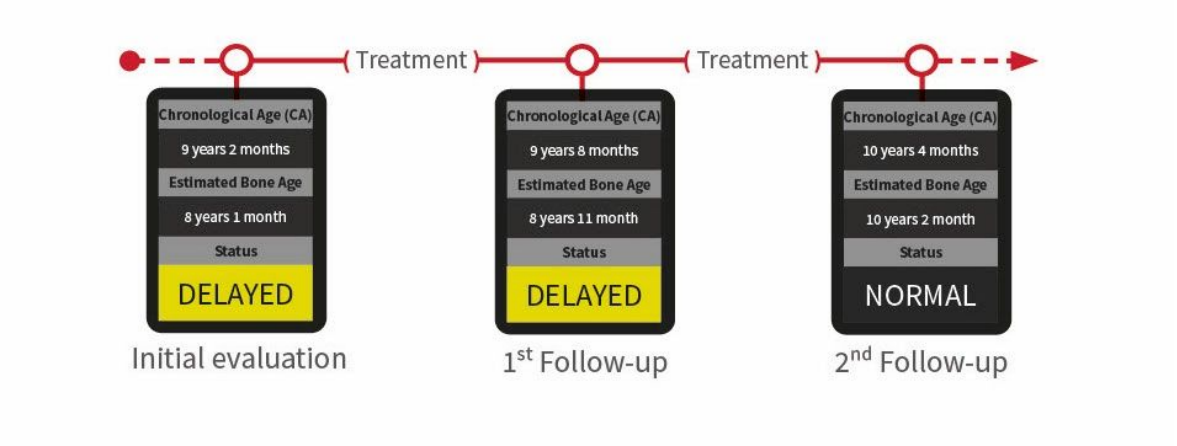
Integration into PACS and RIS

IB Lab's AI-supported software solutions can easily be integrated in the existing PACS and RIS workflow: Images are forwarded from the PACS to one of IB Lab's software modules and annotations are attached to the original study. Medical experts view the results in any DICOM viewer and the respective report is available in a black PDF/SC printable PDF as well.
The AI-results are fed as a text into - by users - pre-defined RIS-template for accelerated reporting. Ultimately, physicians decide whether or not to accept the results of IB Lab's AI-driven solutions.



Monitoring of disease progression

Standardized measurements and highlighting of key findings facilitates comparison to priors and supports clinicians in making treatment decisions.



References

1. Greulich WWalter, Pyle SI. 1959. Radiographic atlas of skeletal development of the hand and wrist, 2nd edition. Stanford Univ. Press. 256 p. [cited 2019 Oct 31].
2. Halabi SS, Prevedello LM, Kalpathy-Cramer J, et al. 2018. The RSNA Pediatric Bone Age Machine Learning Challenge. Radiology 290(2):498–503.
3. Simmons K, Greulich WW. 1944. The Brush Foundation Study of Child Growth and Development: II. Physical Growth and Development. Monogr. Soc. Res. Child Dev. 9(1):i–87.
4. Bayley N, Pinneau SR. 1952. Tables for predicting adult height from skeletal age: Revised for use with the greulich-pyle hand standards. J. Pediatr. 40(4):423–441.
5. Larson DB, Chen MC, Lungren MP, et al. 2018. Performance of a Deep-Learning Neural Network Model in Assessing Skeletal Maturity on Pediatric Hand Radiographs. Radiology 287(1):313–322.