How to interpret the HEP 6-in-1 report

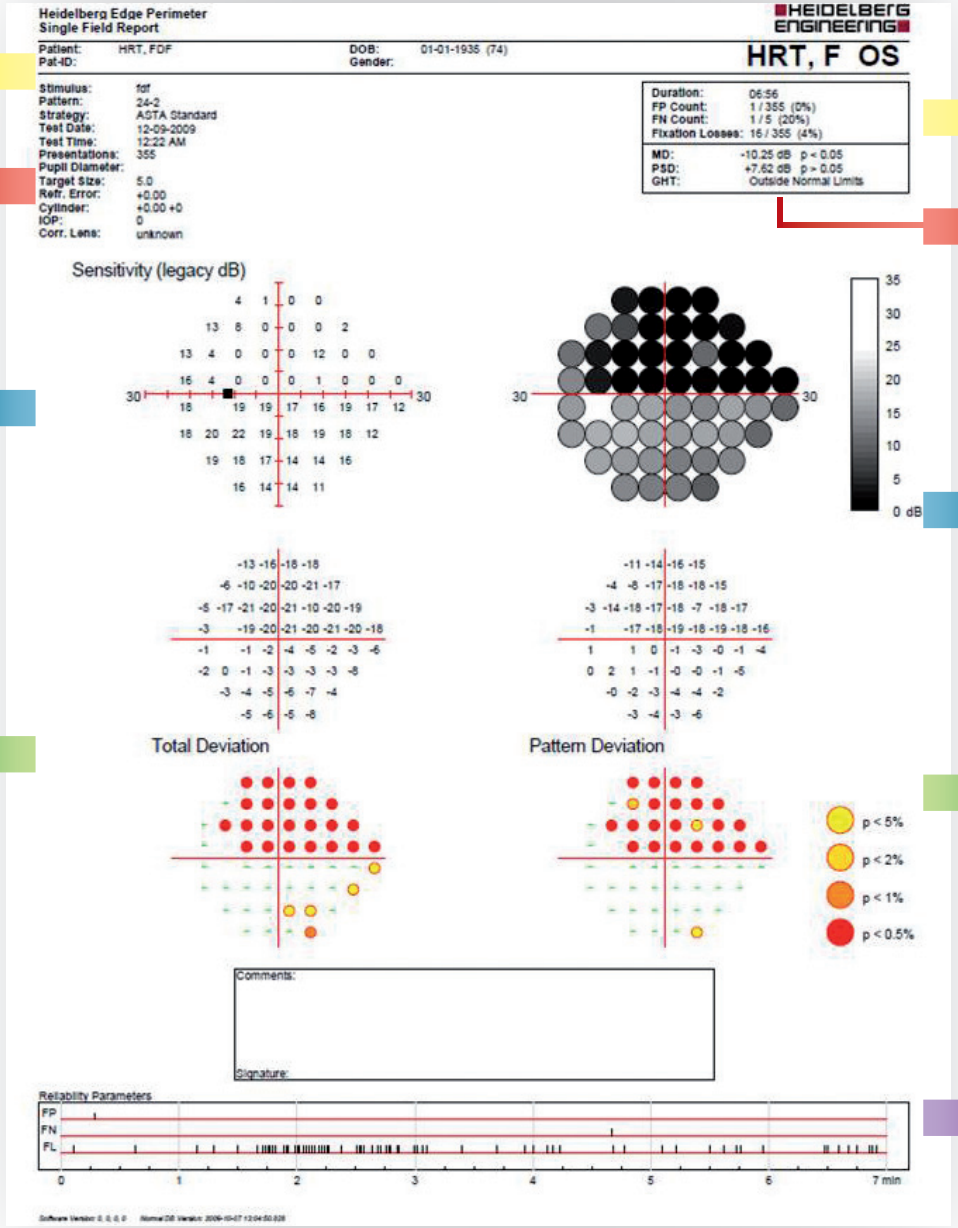
HEIDELBERG ENGINEERING

Patient data:
This section displays general patient data such as patient name, birth date and patient ID.

Test Information:
This section displays information about the test time and date, the kind of stimulus used, stimulus size, test pattern, pupil diameter, refraction and refractive devices used during visual field acquisition.

Sensitivity:
The decibel plot of estimated sensitivity. The values picture the patient's individual hill of vision. High dB values indicate a high sensitivity.

Total Deviation:
The numerical plot shows the deviation of the patient's sensitivity from age-matched normals in decibels. The lower plot shows color-coded symbols of the same data. Each location is color-coded relative to the normal data confidence limits. Green symbols are within normal age-matched limits ($p > 5\%$). Numbers in yellow ($2\% < p \leq 5\%$) or orange ($0.5\% < p \leq 2\%$) are borderline, and in red ($p < 0.5\%$) are considered outside of normal limits.



Patient Performance:
This section is an indicator of the patient's attention and reliability and displays the total number of False Positive and False Negative catch trials as well as Fixation Losses during the test.

Global Indices:
This important section summarizes the visual field status. Mean Deviation (MD), average defect across the entire visual field, and Pattern Standard Deviation (PSD), a measure of localized variability, along with the Glaucoma Hemifield Test (GHT), assist the practitioner evaluate the visual field.

Grayscale:
The non-interpolated grayscale plot gives an immediate and easily comprehensible picture of measured visual field sensitivity.

Pattern Devitation:
The PD plot illustrates the data after it has been corrected for generalized defect. The numerical upper plot shows the deviation from normal in decibels. The lower plot shows color-coded symbols of the same data. Each location is color-coded relative to the normal data confidence limits. The PD better illustrates focal defects independent of the effect of cataract or pupil size.

Reliability Parameters:
This graph gives an overview of number and time of occurence of False Positives, Falses Negatives and Fixation Losses during the visual field acquisition.

The step-by-step guide to clinical interpretation

HEP

① Assessment of visual field reliability.

The first step in clinical interpretation of any printout is an assessment of the quality of performance. Make sure you are interpreting a good quality printout, because poor quality can affect your diagnostic interpretation and disease management. The three measures of reliability in visual field acquisition are fixation losses, false negative and false positive answers.

Fixation Losses (FL) of 20% or higher may indicate an unreliable field. FLs can sometimes be recorded when it appears that the patient is maintaining good fixation if the video image is unable to be efficiently analyzed. Ensure that the objective lens or any corrective lenses are well centered and clean, and that reflections on the objective lens are minimized.
False Negative (FN) answers occur if a patient does not respond to a stimulus that should be visible for that patient. Because FNs increase with worsening visual field loss, a high number of FNs in a glaucomatous field does not necessarily represent unreliable data. Look out for FNs appearing toward the end of a test as it may indicate fatigue.
False Positive (FP) answers on the other hand, are always an indicator of an unreliable test. They occur when the patient responds when a response was not expected. FPs make the visual field look better (more sensitive) than it actually is and may mask shallow depressions. Patients with high FP rates may also have a white grayscale and/or abnormally high threshold values in the sensitivity plot especially in the peripheral parts of the field. An examination with a FP rate of 15% or higher should be considered unreliable.

② Search for glaucomatous defects.

The **grayscale** should not be used for decision-making in glaucoma, but it is helpful to draw attention to areas that need further evaluation using number and probability plots. **Deviation plots** and their corresponding **statistical probability plots** demand the most attention. These plots identify areas of the field that are abnormal compared with an age-matched normal population for each point tested. The information is both given in decibels and in statistical probability values. In the probability plots increasing orange and red areas represent increasingly significant deviations from normal.

The **pattern deviation** (PD) plot gives the same type of information as the **total deviation** (TD) plot, after the visual field has been adjusted for any overall depression or elevation. This plot is helpful in patients who may have a combined overall depression for example due to media opacity or small pupils, as well as localized loss from glaucoma.
When evaluating the deviation plots the clinician should look for **clusters of abnormal points** in locations typical for glaucomatous loss (nasal step, arcuate defect, paracentral scotoma). A single statistically significant point may not be clinically significant, but a group of connected points that all reach statistical significance is unlikely to be normal.
A **cluster of three or more connected points** in the same side of the horizontal meridian that all reach statistical significance, with at least one of the points reaching the $p < 1\%$ significance level, is likely to be a true visual field defect if repeatable.

③ Check Glaucoma Hemifield Test and global indices.

The **GHT** is based on the fact that glaucoma damages the superior and inferior fields asymmetrically. The GHT compares mirror-image clusters of points in the superior and inferior fields, and it alerts the clinician when significant differences are found between the two hemifields. A GHT message with “outside normal limits” on two occasions and corresponding optic nerve or RNFL loss is very strong evidence that glaucoma is present.
The **Mean Deviation** (MD) is a measure of the average deviation between the patient‘s sensitivity and that of the age-matched normals. It gives a sense of the overall “height” of an age-matched normal hill of vision and but is not particularly sensitive or specific for glaucomatous damage. MD is affected by media and small pupils.
The **Pattern Standard Deviation** (PSD) is a measure that reflects the shape or “smoothness” of the hill of vision and is designed to measure localized loss, such as that found in glaucoma. A PSD that reaches a 5% statistical significance level on multiple examinations, in the presence of other suspicious clinical findings, is very strong evidence that a glaucomatous field defect is present.

Once a visual field defect has been determined to be abnormal, the field loss has to be classified as mild, moderate or severe, based on the size and depth of the defect and whether or not central vision is affected. From this point on the clinician‘s job is to evaluate the field for **progression.**

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