**Supplementary Table 1**. Performance of the selected 6 pCLE criteria for a diagnosis of any dysplasia in the blinded validation (Phase II, 23 NDBE, 24 LGD and 10 HGD cases) by 6 endoscopists (in brackets the lower bound of the upper 95% credible interval). AROC: Area under the Receiving Operating Characteristics Curve.

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| **Criterion** | **Average****Sensitivity** (%) | **Average****Specificity** (%) | **Average****Accuracy** (%) | **Fleiss'****kappa** | **AROC** |
| Dark non-round glands | 67.2 (52.9) | 79 (61.9) | 73.1 | 0.56  | 0.832 |
| Irregular gland shape | 82.8 (69.5) | 75.4 (58) | 79.1 | 0.649  | 0.881 |
| Lack of goblet cells | 66.2 (51.9) | 76.1 (58.8) | 71.1 | 0.387  | 0.845 |
| Variable degree of darkness with sharp cut-off | 69.6 (55.4) | 71.7 (54.3) | 70.7 | 0.308  | 0.858 |
| Variable size of cells | 71.6 (57.4) | 73.2 (55.8) | 72.4 | 0.311  | 0.898 |
| Cellular stratification | 61.8 (47.6) | 76.8 (59.5) | 69.3 | 0.308  | 0.854 |
| **Overall diagnosis** | 84.3 (71.2) | 78.3 (61.1) | 81.3 | 0.657 | 0.939 |
| **Cut-off** ≥3 positive criteria | 84.8 (71.7) | 74.6 (57.3) | 79.7 | 0.647  | 0.902 |

**Supplementary Table 2**. Performance of the selected 6 pCLE criteria for a diagnosis of HGD in the blinded validation (Phase II, 23 NDBE and 10 HGD cases) by 6 endoscopists (in brackets the lower bound of the upper 95% credible interval). AROC: Area under the Receiving Operating Characteristics Curve.

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| **Criterion** | **Average****Sensitivity** (%) | **Average****Specificity** (%) | **Average****Accuracy** (%) | **Fleiss'****kappa** | **AROC** |
| Dark non-round glands | 73.3 (46.6) | 79 (61.9) | 76.2 | 0.484 | 0.909 |
| Irregular gland shape | 90 (63.6) | 75.4 (58) | 82.7 | 0.632 | 0.926 |
| Lack of goblet cells | 71.7 (45.1) | 76.1 (58.8) | 73.9 | 0.385 | 0.896 |
| Variable degree of darkness with sharp cut-off | 73.3 (46.6) | 71.7 (54.3) | 72.5 | 0.324 | 0.898 |
| Variable size of cells | 86.7 (59.9) | 73.2 (55.8) | 79.9 | 0.392 | 0.978 |
| Cellular stratification | 56.7 (32.3) | 76.8 (59.5) | 66.7 | 0.309 | 0.833 |
| **Overall diagnosis** | 95.0 (69.5) | 78.3 (61.1) | 86.6 | 0.684 | 0.98 |
| **Cut-off** ≥3 positive criteria | 91.7 (65.5) | 74.6 (57.3) | 83.2 | 0.641 | 0.941 |