

# **Optimizing Snapshot Gallery Presentation of Artificial Intelligence-inferred Diagnostic Cell Images** for Urine Cytology Diagnosis

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## Introduction

- A deep-learning-based AI algorithm has been developed to assist in diagnosis of urine cytology.
- A gallery presentation of Al-inferred suspicious cancer cell images has been designed to improve the effectiveness of digital cytology.
- Gallery presentation allows for a quick review of selected diagnostic cells in the whole-slide image (WSI), which could facilitate diagnosis.
- In this study, different numbers of diagnostic cell images in the gallery were evaluated by cytotechnologists to determine the optimal number of cells for gallery presentation to assist urine cytology reporting.

### **Materials and Methods**

- 90 urine cytology slides were scanned for WSIs, including 45 with high-grade urothelial carcinoma (HGUC) and 45 with negative for HGUC (NHGUC).
- An in-house developed AI algorithm was used to provide risk stratification of suspicious cancer cells for each WSI.
- Diagnostic cell images were selected and displayed in galleries of 12, 24, 36, and 48 images, categorized by cancer risk.
- Two cytotechnologists used an in-house viewer software (Figure 1) to review the cell galleries and render a diagnosis based on The Paris System categories (NHGUC/AUC/SHGUC/HGUC).
- The concordance rate between microscopy and cell gallery diagnoses was evaluated for each WSI.



Cell image in the gallery presented a suspicious cancer cell (in the center) and surrounding cells that may not be suspicious cancer cells (red arrows).

## Results

#### Table 1. Concordance rates between microscopy and snapshot gallery diagnosis

Microscope diagnostic category	HGUC (N= 45)		<b>NHGUC (N= 45)</b>	
Cell image number in a gallery	Concordance rate		Concordance rate	
	Cytotech A	Cytotech B	Cytotech A	Cytotech B
12	46.7%	31.1%	93.3%	91.1%
24	86.7%	71.1%	91.1%	91.1%
36	95.6%	84.4%	91.1%	88.9%
48	91.1%	91.1%	91.1%	88.9%

- rates for HGUC specimens from 31.1% to 91.1%

- gallery of 48 cell images.
- two cytotechnologists.



Increasing the number of diagnostic cells in the gallery improved the concordance

• For NHGUC specimens, the concordance rates decreased from 93.3% to 88.9%.

Cytotechnologist A had the highest concordance rate for HGUC specimens in the gallery of 36 cell images, but the rate slightly decreased in 48 cell images.

Cytotechnologist B had the highest concordance rate for HGUC specimens in the

#### Conclusion

Galleries of 36 or 48 diagnostic cell images provide the highest concordance rates between digital urine cytology diagnosis and microscopy for cytotechnologists.

• Inter-observer variation in gallery diagnostic results was observed between the

• Further investigation is needed to determine the efficacy of the snapshot gallery in urine cytology diagnosis compared to microscopy and WSI diagnoses.