

Enhancing Clinical Healthcare Operations and Diagnosis Coding Efficiency with the Application of Artificial Intelligence Coding Assistance System at Chang Gung Memorial Hospital, Taiwan

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INTRODUCTION

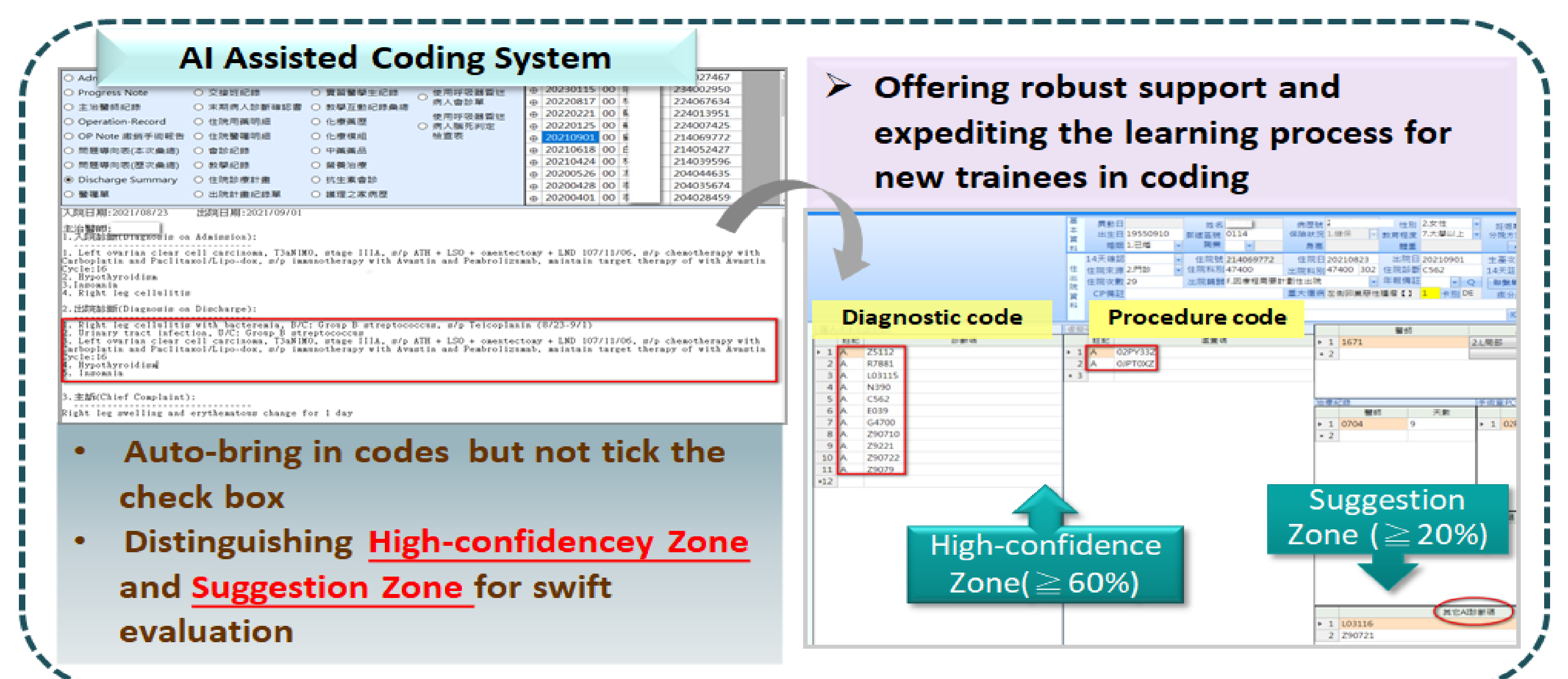
In recent years, the use of Artificial Intelligence(AI) for assisting medical teams in ICD-10-CM/PCS disease classification has become a predominant trend. Since 2005, Chang Gung Memorial Hospital(CGMH) in Taiwan initiated comprehensive electronic medical record(EMR) structuring to enhance the utility in medical research. In 2020, the hospital developed the "**AI Assisted Coding System**" and it aids medical teams in disease classification coding tasks, fostering the integration of clinical medical research with the application of structured electronic medical records.

METHOD

Modeling Structure: SciBERT model has achieved great performance in several natural language processing benchmarks since it was pre-trained by extensive texts of scientific literature (Beltagy et al, 2019). To develop AI adjuvant coding assistant, we fine tuned sciBERT with ~100,000 medical records collected from 2018 to 2019 for multi-labeled text classification. The suggested codes by the model were further verified by coding specialists and their feedback was provided to retrain the model iteratively. We also implement a **color-label annotation of medical record text system**, and for instance of AI error coding, the corresponding keywords are labeled. We regularly retrain the model every three months by adding about 80,000 new medical records each time to mitigate the model drift. The performance metrics of Micro-F1 and Macro-F1 for suggesting diagnostic codes was 88.5% and 77.9%, and for procedure codes was 87.3% and 73.1% respectively.

Intelligence Interface: For clinical practice, "**AI Assisted Coding System**" displayed codes in the top panel of the system directly with predicted probability exceeds 0.6, codes from 0.2-0.6 were sorted and displayed in the bottom panel for coding specialists to consider. The AI Intelligence Interface offers significant benefits by streamlining the code search process and reducing time for manual input.

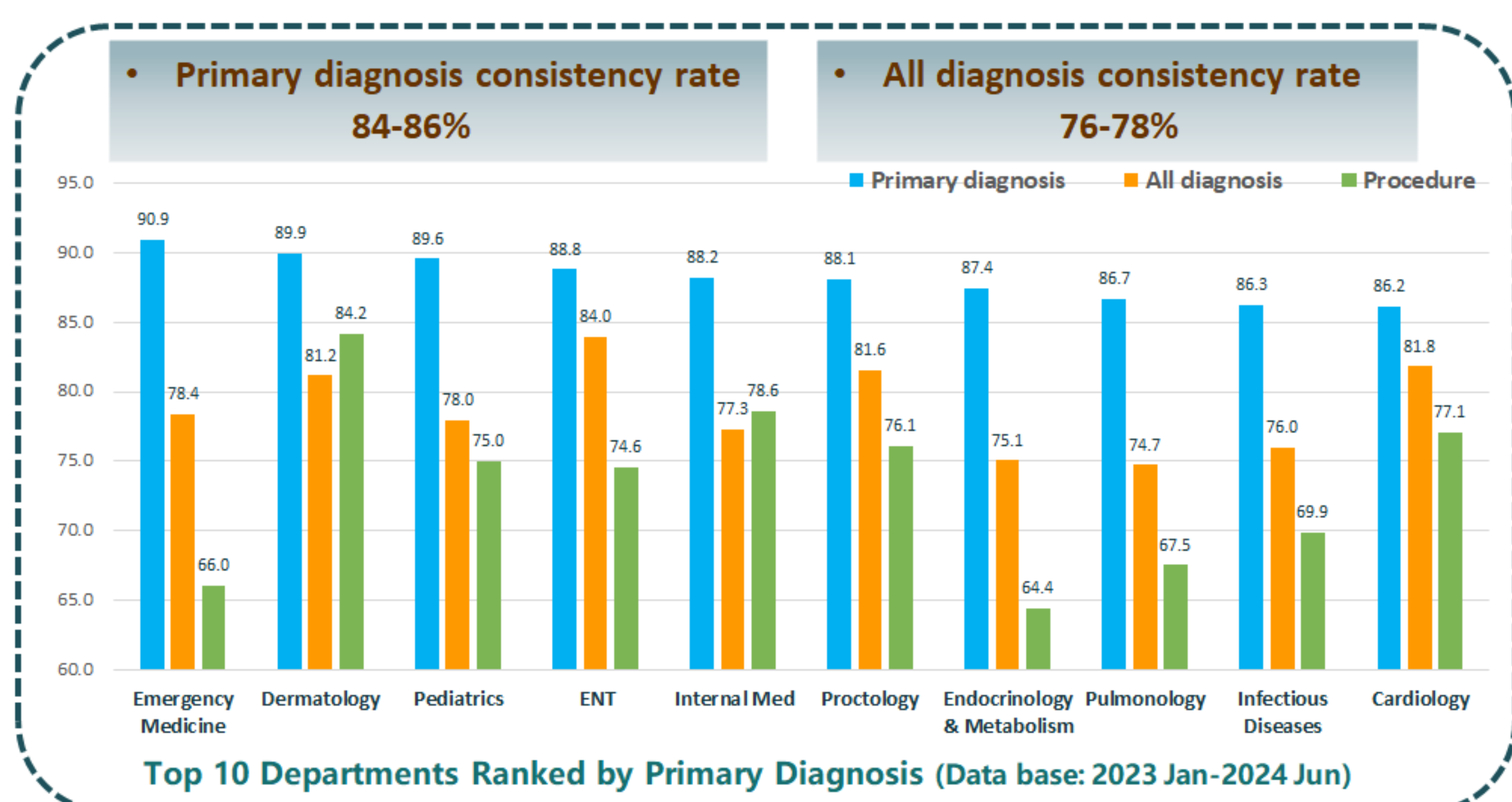
Informatization Assistance: We aid physicians in structuring the content fields of surgical records with insights from a professional disease classification team. This collaborative effort aims to improve the integrity of the input text to AI coding.



AI Assisted Coding System Intelligence Interface

RESULTS

The CGMH **"AI Assisted Coding System"** has successfully coded approximately 1 million medical records since December 2020. Up to 2023, the system has demonstrated a remarkable achievement with a diagnosis consistency rate of up to 78% and a procedure consistency rate of about 75%. Leveraging AI assistance, each case experiences a time-saving of around 2.2 minutes, encompassing both search and key-in activities. It results in a total reduction from 12 minutes to 9.8 minutes per case. Regarding user satisfaction, the "AI Assisted Coding System" has consistently achieved an average rating of 92%.

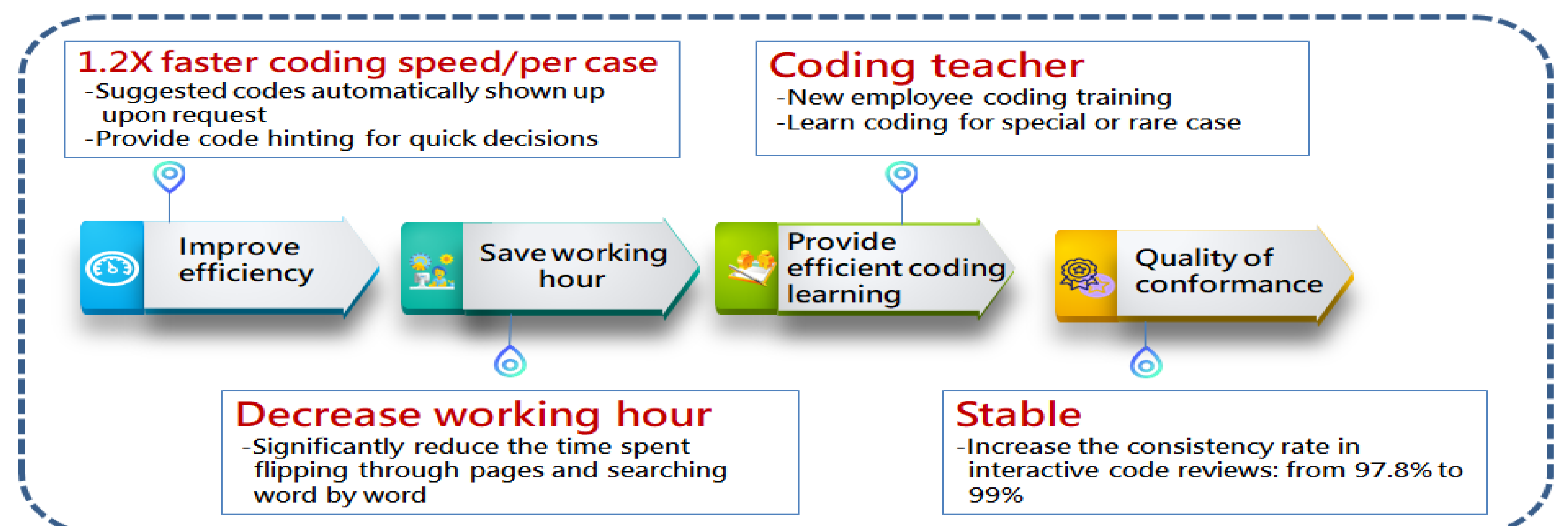


Performance of ICD-10 AI Assisted Coding System

CONCLUSIONS

The "**AI Assisted Coding System**" serves as a valuable asset for the **disease classification team**, offering robust support and expediting learning process for new trainees in coding. It also has been extended to **encompass Inpatient medical records**, facilitating feedback mechanisms to **enhance the quality of documentation** while simultaneously optimizing cost control for Diagnosis-Related Group (DRG) management.

We implement regular automatic updates to enhance the model's functionality, and continuously optimize the model by advanced coding staff team, serving as professional model feedback contributors. We have seamlessly integrated AI with our Health Information System(HIS) to **enhance the efficiency of clinical coding**. This initiative represents a crucial innovation in the field of healthcare information technology and holds the potential for widespread application for other healthcare systems in the future.



Benefit of ICD-10 AI Coding System

REFERENCES

Beltagy, I., Lo, K., & Cohan, A. (2019, November 3–7). *SciBERT: A Pretrained Language Model for Scientific Text*. Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), pages 3615–3620, Hong Kong, China.

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