

MedFact: Benchmarking the Fact-Checking Capabilities of Large Language Models on Chinese Medical Texts

Jiayi He, Yangmin Huang*, Qianyun Du*, Xiangying Zhou,
Zhiyang He, Jiaxue Hu, Xiaodong Tao, Lixian Lai

Xunfei Healthcare Technology Co., Ltd.

{jyhe14, ymhuang9, qydu, xyzhou30, zyhe, jxhu2, xdtao, lxlai2}@iflytek.com

Abstract

Deploying Large Language Models (LLMs) in medical applications requires rigorous fact-checking to ensure patient safety and regulatory compliance. We introduce **MedFact**, a challenging Chinese medical fact-checking benchmark with 2,116 expert-annotated instances from diverse real-world texts, spanning 13 specialties, 8 error types, 4 writing styles, and 5 difficulty levels. Construction uses a hybrid AI-human framework where iterative expert feedback refines AI-driven, multi-criteria filtering to ensure high quality and difficulty. We evaluate 20 leading LLMs on veracity classification and error localization, and results show that models can often determine whether text contains errors but struggle to localize them precisely, with top performers falling short of human performance. Our analysis reveals an “over-criticism” phenomenon, where models misidentify correct information as erroneous, a tendency that is aggravated by advanced reasoning techniques such as multi-agent collaboration and inference-time scaling. MedFact highlights the challenges of deploying medical LLMs and provides resources to develop factually reliable medical AI systems.¹

1 Introduction

Large Language Models (LLMs) (OpenAI, 2024a; DeepSeek-AI, 2025a; Anthropic, 2024; Tang et al., 2026), renowned for their versatile capabilities in natural language processing (NLP), are increasingly being applied to real-world medical applications (Huang et al., 2024; Wu et al., 2025), such as clinical decision support (Rao et al., 2023), patient assessment (Zack et al., 2024), diagnosis (Kuroiwa et al., 2023), and text classification (Zhang et al., 2022). Medical texts sourced from the internet are also widely integrated into Retrieval-Augmented

Generation (RAG) frameworks for medical dialogue AI systems in real-world deployments. However, these texts often contain factual errors, and their use in clinical consultation scenarios poses severe risks, including patient harm, regulatory non-compliance, and legal liability. Ensuring the factual accuracy of medical content is therefore essential for the responsible deployment of LLM-based medical systems (Wang and Togher, 2024).

Despite this importance, existing benchmarks primarily evaluate LLM performance on tasks such as medical question answering (QA) (Jin et al., 2021) and relation extraction (Guan et al., 2020), leaving their factual reliability largely underexplored. Current efforts to address this gap remain limited. For instance, VeriFact (Chung et al., 2025) evaluates fact-checking on synthetic, LLM-generated clinical text, while MEDEC (Abacha et al., 2025) is restricted to error detection in clinical notes. By focusing on synthetic data or a single text genre, these benchmarks fail to capture the diversity of medical information encountered in real-world medical AI systems. This limitation hinders the development of trustworthy medical AI systems, underscoring the need for a benchmark that encompasses a broader range of realistic medical content to facilitate a comprehensive evaluation of LLM fact-checking capabilities.

To address these issues, we introduce **MedFact**, a challenging benchmark for Chinese medical fact-checking, built upon three core principles:

- **Rigorously Designed Pipeline:** We construct MedFact through a *human-in-the-loop* pipeline that integrates large-scale AI filtering with fine-grained annotation by medical professionals. We also employ hard-case mining to systematically retain challenging instances designed to probe the limits of current LLMs.
- **Broad and Realistic Coverage:** MedFact is curated from diverse real-world texts such as

* Corresponding authors.

¹Page: <https://iflytek-medical-southchina.github.io/MedFact/>

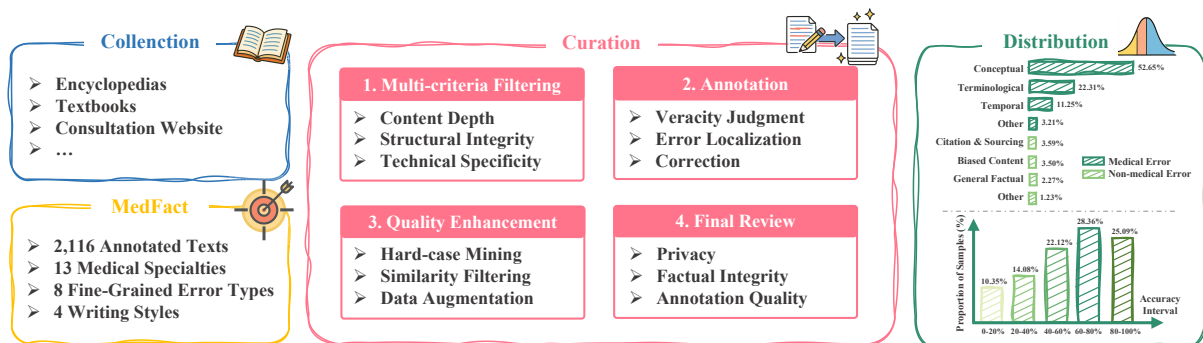


Figure 1: An overview of the data construction pipeline and the components of MedFact.

medical encyclopedias. It comprises 2,116 expert-annotated medical texts that span 13 medical specialties, 8 fine-grained error types, 4 writing styles, and multiple difficulty levels. 6,405 verified-accurate medical texts from identical sources are provided, enabling realistic evaluation under RAG augmentation.

- **Uncontaminated Data:** MedFact is constructed from proprietary texts that are highly unlikely to have appeared in the pre-training data of evaluated LLMs, ensuring a fairer assessment of their fact-checking capabilities.

We benchmark 20 LLMs on MedFact across veracity classification and error localization tasks. State-of-the-art models still perform below human experts. While RAG can improve performance, multi-agent collaboration and inference-time scaling induce overly critical bias, causing frequent misclassifications of correct texts as incorrect. This highlights the gap between current LLM capabilities and the requirements for safe medical deployment. Our main contributions are:

- We introduce MedFact, a novel Chinese medical fact-checking benchmark with rigorous construction, broad real-world coverage, and a design that mitigates data contamination.
- We present an evaluation of 20 LLMs, revealing a significant performance gap relative to humans on veracity classification and the precise localization of factual errors.
- We analyze advanced strategies such as inference-time scaling and reveal an “over-criticism” phenomenon where models excessively flag correct information as erroneous.

2 Related Works

2.1 LLMs in Medical Domains

LLMs have prompted extensive exploration of medical applications (Huang et al., 2024). Med-prompt (Nori et al., 2023) enhances medical performance by combining self-generated Chain-of-Thought (CoT) (Wei et al., 2022), few-shot learning with dynamic examples (Liu et al., 2022), and self-consistency (Wang et al., 2023b). Other developments include HuaTuo (Wang et al., 2023a), a LLaMA-based model fine-tuned on Chinese medical instructions, and PediatricsGPT (Yang et al., 2024), developed through systematic training for pediatric and general medical applications. These efforts show growing interest in adapting LLMs to medical reasoning and practice requirements.

2.2 Evaluating Medical Knowledge in LLMs

Numerous benchmarks evaluate LLM medical knowledge (Abacha et al., 2025). MedQA (Jin et al., 2021), derived from the United States Medical Licensing Examinations, is a multiple-choice QA dataset that assesses clinical knowledge. HealthBench (Arora et al., 2025) benchmarks realistic health conversations using physician-created rubrics. MedXpertQA (Zuo et al., 2025) evaluates expert-level medical knowledge through textual and multimodal tasks. Existing medical fact-checking benchmarks focus on narrow contexts. VeriFact (Chung et al., 2025) verifies synthetic text against structured Electronic Health Records using retrieval-augmented generation (RAG) and LLM-as-a-Judge. MEDEC (Abacha et al., 2025) provides error detection and correction benchmarks confined to clinical notes. By relying on synthetic data or single genres, these benchmarks fail to capture diverse real-world contexts, limiting their utility for assessing model generalization.

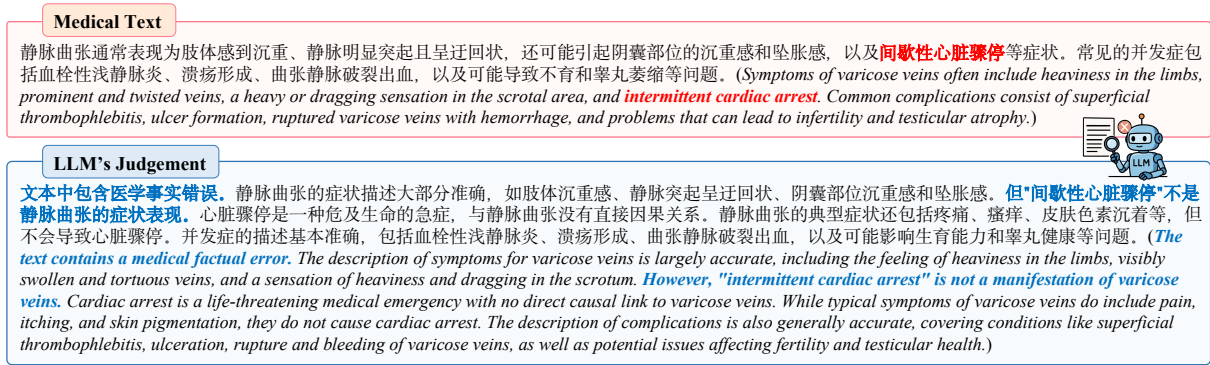


Figure 2: An example of fact-checking performed by Claude 3.7 Sonnet.

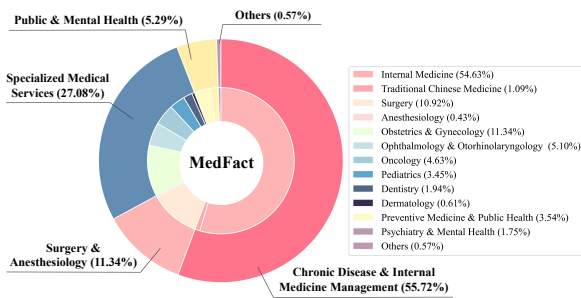


Figure 3: Distribution of the specialties in MedFact.

2.3 Evaluating Factuality in LLMs

Recent research has established benchmarks for factuality in LLMs. SimpleQA (Wei et al., 2024) measures short-form factuality using single-answer questions adversarially collected to challenge models such as GPT-4. OpenFactCheck (Iqbal et al., 2024) proposes a unified framework for benchmarking fact-checking across diverse sources, including free-form text and LLM-generated content. These benchmarks lack the domain-specific nuances required for high-stakes fields such as medicine. This highlights the need to bridge two gaps: the lack of domain-specific context in general factuality benchmarks and the lack of real-world diversity in medical fact-checking benchmarks.

3 MedFact

3.1 Data Collection

The construction pipeline for MedFact is illustrated in Figure 1. We began with a corpus of 27,116 medical texts secured through a copyright-compliant data-sharing agreement with a commercial partner. The source materials are primarily drawn from the partner's internal medical encyclopedia, supplemented with content from its medical consultant

platforms, including question-answering pages and user forum discussions. As these sources have not been released to the public, this approach mitigates the risk of training data contamination.

3.2 Data Curation

Multi-criteria Filtering We defined a suite of seven leading LLMs: GPT-4o (OpenAI, 2024b), GPT-4.5 (OpenAI, 2025a), o1 (OpenAI, 2024c), Gemini 2.5 Pro (DeepMind, 2025), DeepSeek-R1 (DeepSeek-AI, 2025a), Claude 3.7 Sonnet (Anthropic, 2025), and Doubao-Seed-1.6-thinking (ByteDance, 2025). This model suite formed an ensemble that, via majority vote, filtered the initial corpus by discarding texts identified as *overly simplistic* (e.g., lacking medical knowledge), *esoteric* (e.g., highly specialized content), or *malformed* (e.g., missing a clear subject or context), achieving a Fleiss' κ of 0.75 and pairwise consistency exceeding 80% on this filtering task. This automated process was refined through a three-round, iterative *human-in-the-loop* feedback mechanism inspired by Wu et al. (2024). In each round, medical experts reviewed a 5% sample of filtered data. We then used their annotations on misclassified items to construct a more effective retrieval-augmented, few-shot prompt for the subsequent round. This prompt leveraged criterion-specific retrieval, augmenting each input with the most semantically similar expert-annotated example for each of our three filtering criteria: simplistic, esoteric, and malformed. Over three rounds, the acceptance rate decreased from 67.69% to 37.00%, and finally to 23.62%. The resulting filter achieved 96.40% agreement with expert judgments, reducing the candidate pool from 27,116 to 6,405 texts.

Human Annotation The filtered corpus was then annotated by a team of three fully licensed med-

ical professionals. The annotation for each text comprised: (a) a *binary veracity judgment* (correct/incorrect); (b) for incorrect texts, *the precise error span*; and (c) a *suggested correction*.

Quality Enhancement We applied automated techniques to enhance dataset quality and difficulty, reducing instances to 2,862:

- **Hard-case Mining:** We evaluated all instances with our model suite and removed those that all models classified correctly, filtering for more challenging cases.
- **Similarity Filtering:** We computed sentence embeddings for all texts using all-mpnet-base-v2 (Reimers and Gurevych, 2019). For text pairs with cosine similarity exceeding 0.9, we retained only one instance.
- **Data Augmentation:** We prompted randomly selected models from our suite to paraphrase and de-identify each text under two constraints: (a) preserving original medical content; and (b) removing all Personally Identifiable Information (PII).

Final Human Review Medical professionals conducted a review, verifying: (a) automated paraphrasing did not introduce errors or alter original medical intent; (b) all PII was removed; and (c) annotations remained accurate. Texts failing these checks were corrected or discarded. This process resulted in the final MedFact of 2,116 instances.

3.3 Data Statistics & Analysis

Overview MedFact contains 2,116 expert-annotated medical texts curated from real-world data. The dataset comprises 1,058 medically correct texts and 1,058 texts with a single factual error. It was constructed using a hybrid AI-human framework that combines large-scale multi-criteria filtering, hard-case mining, similarity filtering, and LLM-based augmentation with human expert review to ensure *high data quality, diversity, and difficulty*. Figure 2 presents an instance; additional examples are provided in the Appendix.

Data Diversity MedFact covers 13 medical specialties, with a distribution led by Internal Medicine (1,156 instances), followed by Obstetrics and Gynecology (240), Surgery (231), and ten other fields. These are grouped into four high-level domains: Internal Medicine and Chronic Care; Surgical and

Error Category	Count	Proportion (%)
I. Medical Errors		
Conceptual	557	52.65
Terminological	236	22.31
Temporal	119	11.25
Other Medical	34	3.21
II. Non-Medical Errors		
Citation & Sourcing	38	3.59
Biased Content	37	3.50
General Factual	24	2.27
Other Non-Medical	13	1.23

Table 1: Distribution of 8 fine-grained error types among the 1,058 incorrect instances in MedFact.

Procedural Care; Specialized Clinical Fields; and Public and Mental Health (Figure 3). This distribution reflects a realistic range of medical topics, consistent with the distribution of the 27,116 original medical texts. Beyond its topical breadth, MedFact exhibits stylistic diversity. The corpus is drawn from a variety of writing styles, including formal encyclopedia articles rich in professional terminology, popular science journalism, user-generated web content from peer-to-peer and patient-physician Q&A, and fabricated misinformation. This diversity ensures that MedFact mirrors the complexity of real-world medical information, facilitating a robust evaluation of an LLM’s generalizable fact-checking capabilities.

Error Taxonomy Developed in consultation with professionals, our error taxonomy for MedFact distinguishes two primary categories: medical and non-medical errors. Medical errors are subdivided into Conceptual, Terminological, Temporal, and Other Medical Errors, while non-medical errors are classified as Citation and Sourcing, Biased Content, General Factual, and Other Non-Medical Errors. As shown in Figure 1 and Table 1, the distribution across the 1,058 incorrect instances is skewed toward medical errors (89.41%). The prevalence of medically grounded errors underscores that successful performance on MedFact requires a deep understanding of medical principles.

Difficulty Grading Instances in MedFact are stratified into five difficulty levels based on the aggregated success rate of our model suite on the error localization task (metrics detailed in the Experiments section). As shown in Figure 1 and Table 2, the resulting distribution across levels is relatively balanced. This ensures sufficient examples at each level, enabling fine-grained differentiation across a

Accuracy Interval	Count	Proportion (%)
0–20%	219	10.35
20–40%	298	14.08
40–60%	468	22.12
60–80%	600	28.36
80–100%	531	25.09

Table 2: Distribution of samples in MedFact, categorized by accuracy score intervals.

broad range of model capabilities.

4 Experiments

4.1 Experimental Setup

Models We evaluate 20 models on MedFact:

- **Open-source:** II-Medical-8B (Internet, 2025), HuatuoGPT-o1-7B (Chen et al., 2024), DeepSeek-R1 (2025-05-28), DeepSeek-V3 (2025-03-24) (DeepSeek-AI, 2025b), Qwen2.5-72B-Instruct (Team, 2024), Qwen3-235B-A22B (Team, 2025), DeepSeek-R1-Distill-Llama-70B (DeepSeek-AI, 2025a), DeepSeek-R1-Distill-Qwen-32B (DeepSeek-AI, 2025a).
- **Proprietary:** XiaoYi (2025-06-24) (Healthcare, 2025), GPT-4o (2024-11-20), GPT-4.5, o1, o3 (OpenAI, 2025b), Claude 3.7 Sonnet, Gemini 2.5 Flash (DeepMind, 2025), Gemini 2.5 Pro, Grok-4 (xAI, 2025), Qwen2.5-Max (Team, 2024), ERNIE-X1 (Baidu, 2025), Doubao-Seed-1.6 (ByteDance, 2025).

XiaoYi, HuatuoGPT-o1-7B, and II-Medical-8B are specifically trained for medical domains. We evaluate Doubao-Seed-1.6 in standard and thinking modes; the thinking-mode results are listed as Doubao-Seed-1.6-thinking.

Evaluation Strategies We evaluate models using zero-shot and Chain-of-Thought (CoT) prompting (Wei et al., 2022), and assess top-performing models using four reasoning strategies:

- **MedPrompt** (Nori et al., 2023): A composite strategy that combines self-generated CoT, retrieval-augmented few-shot examples, and self-consistency (Wang et al., 2023b).
- **RAG** (Lewis et al., 2020): A technique that grounds model outputs by first retrieving relevant texts from an external knowledge corpus to use as context.

- **MAD** (Liang et al., 2024): A multi-agent framework where agents engage in a multi-round debate to reach a consensus.
- **MDAgents** (Kim et al., 2024): A medical framework adaptively engaging multi-agent collaboration based on the input’s difficulty.

Evaluation Metrics We evaluate performance on two tasks using Precision, Recall, and F1 score:

- **Veracity Classification (VC):** Binary classification evaluating whether models identify medical texts as correct or incorrect. The “incorrect” label serves as the positive class.
- **Error Localization (EL):** For texts correctly classified as incorrect, this evaluates the model’s ability to identify the precise error span. A prediction is considered a true positive if the model correctly localizes the span.

We use GPT-4o as a judge for EL. To validate this choice, we benchmarked five candidate judges against three medical professionals on a random 10% sample, obtaining Cohen’s κ values of 0.800, 0.870, 0.870, 0.845, and 0.865 for DeepSeek-R1, GPT-4o, o1, Claude 3.7 Sonnet, and Gemini 2.5 Pro, respectively. We selected GPT-4o for its strong expert agreement and favorable inference cost.

4.2 Main Results

Overall Performance Table 3 summarizes model performance. Proprietary models consistently outperform open-source counterparts across both tasks and all prompting strategies. Doubao-Seed-1.6-thinking emerges as the top general-purpose model, while XiaoYi leads among medically specialized models. A significant performance gap remains between the best-performing models and human experts. The best EL F1 score, 0.6858, achieved by XiaoYi with CoT, falls below the human baseline of 0.7012.

Task comparison reveals that all models perform worse on EL than on VC. For instance, F1 scores for DeepSeek-V3 and Qwen2.5-Max decrease from 0.6947 and 0.7352 on VC to 0.5380 and 0.6116 on EL, respectively. This suggests that while models can often determine whether text contains errors, they struggle to pinpoint the location. This difficulty often arises from a “*correct-for-the-wrong-reason*” phenomenon: models may correctly classify text as incorrect but misidentify factually sound statements as error sources. Such behavior,

Model	Zero-shot				CoT			
	VC	EL			VC	EL		
	F1	Precision	Recall	F1	F1	Precision	Recall	F1
Human	0.7521	0.7495	0.6588	0.7012	–	–	–	–
Open-source								
II-Medical-8B	0.6361	0.3278	0.2618	0.2911	0.6477	0.2904	0.2240	0.2529
HuatuoGPT-o1-7B	0.5831	0.3054	0.1654	0.2146	0.5932	0.3508	0.1900	0.2465
DeepSeek-R1	0.6847	0.5035	0.7580	0.6051	0.6764	0.5012	0.7826	0.6111
DeepSeek-V3	0.6444	0.5832	0.3809	0.4608	0.6724	0.5266	0.5510	0.5386
Qwen2.5-72B-Instruct	0.5195	0.8024	0.3223	0.4599	0.6400	<u>0.6731</u>	0.4282	0.5234
Qwen3-235B-A22B	0.6944	0.6234	0.5803	0.6011	0.6468	0.6565	0.5076	0.5725
DeepSeek-R1-Distill-Llama-70B	0.6774	0.4990	0.7410	0.5964	0.6882	0.5142	0.7873	0.6221
DeepSeek-R1-Distill-Qwen-32B	0.5524	0.6648	0.3450	0.4543	0.5718	0.6480	0.3393	0.4454
Proprietary								
XiaoYi	<u>0.7126</u>	0.6512	0.7023	0.6758	0.7061	0.6530	0.7221	0.6858
GPT-4o	0.6741	0.4966	0.5595	0.5262	0.6635	0.5012	0.6144	0.5520
GPT-4.5	0.6965	0.5694	0.6824	0.6208	0.6952	0.5971	0.6947	0.6422
o1	0.6713	<u>0.6921</u>	0.5652	0.6223	0.6810	0.6975	0.5775	0.6319
o3	0.6890	0.5355	<u>0.8129</u>	0.6456	0.6870	0.5579	<u>0.8658</u>	0.6785
Claude 3.7 Sonnet	0.6900	0.5242	<u>0.5728</u>	0.5474	0.6943	0.5567	<u>0.6777</u>	0.6113
Gemini 2.5 Flash	0.6787	0.4988	0.7921	0.6121	0.6730	0.4927	0.8299	0.6183
Gemini 2.5 Pro	0.6658	0.4689	0.8346	0.6005	0.6667	0.4828	0.8752	0.6223
Grok-4	0.6951	0.2675	0.2316	0.2482	0.6908	0.2136	0.1692	0.1888
Qwen2.5-Max	0.7006	0.6113	0.5113	0.5569	0.6942	0.5663	0.6219	0.5928
ERNIE-X1	0.6792	0.5580	0.5775	0.5676	0.6871	0.6240	0.5945	0.6089
Doubao-Seed-1.6	0.7122	0.5566	0.6928	0.6173	0.7006	0.5609	0.7268	0.6332
Doubao-Seed-1.6-thinking	0.7139	0.6501	0.6938	<u>0.6712</u>	<u>0.7050</u>	0.6307	0.7344	<u>0.6786</u>

Table 3: Performance of different models on MedFact in zero-shot and CoT settings. For each metric, the best score is in **bold** and the second-best is underlined. The human baseline is the average performance of three professionals.

rooted in a lack of medical knowledge, demonstrates that EL is a more stringent measure of fine-grained understanding and reveals fundamental deficiencies in underlying medical knowledge.

Advanced Reasoning Strategies Table 4 presents results for DeepSeek-R1 and XiaoYi under advanced reasoning strategies against zero-shot baselines. The RAG corpus consists of 6,405 expert-annotated source texts from our data curation process. RAG yields substantial gains on both VC and EL, showing that direct access to external, domain-specific knowledge is effective for medical fact-checking. Multi-agent frameworks, by contrast, exhibit a trade-off: they improve Recall at the expense of Precision, yielding stable F1 for MAD and marginal improvement for MDAgents. We attribute this to “*over-criticism*”: the collaborative process encourages multiple perspectives and error hypotheses, raising models’ propensity to flag errors where none exist and thus lowering Precision. Although these methods are designed to improve reasoning, they can encourage overly skeptical postures in medical fact-checking. Concretely, adding MAD to

DeepSeek-R1 shifts Precision from 0.5488 to 0.5310 while raising Recall from 0.9101 to 0.9565, and MDAgents pushes Recall to 0.9773 at the cost of further depressed Precision (Table 4). The same “Precision down, Recall up” shift recurs across all five models tested under MAD and MDAgents (Table 12 in the Appendix), indicating a systematic mechanism rather than model-specific behavior. We hypothesize that multi-agent deliberation biases verdicts toward “incorrect” because each agent faces an asymmetric incentive: proposing a novel candidate error contributes a visible signal to the consensus, whereas endorsing a correct text contributes nothing distinctive. Aggregation therefore amplifies false-positive hypotheses while suppressing concurrence. This pattern parallels the “over-thinking” phenomenon observed in inference-time-scaled reasoners (Ghosal et al., 2025), where additional deliberation surfaces increasingly tenuous error candidates. In high-stakes medical settings, where falsely flagging an accurate clinical statement carries its own costs, this asymmetry should inform the choice between optimizing for Recall and for balanced F1.

Model	Veracity Classification			Error Localization		
	Precision	Recall	F1	Precision	Recall	F1
DeepSeek-R1	0.5488	0.9101	0.6847	0.5035	0.7580	0.6051
+MedPrompt	0.5657	0.9036	0.6958	0.5221	0.7580	0.6184
+RAG (top-1)	<u>0.6189</u>	0.8658	<u>0.7218</u>	<u>0.5892</u>	0.7647	<u>0.6656</u>
+RAG (top-3)	0.6393	0.8696	0.7369	0.6112	0.7713	0.6820
+MAD	0.5310	<u>0.9565</u>	0.6829	0.4844	<u>0.7940</u>	0.6017
+MDAgents	0.5411	0.9773	0.6965	0.4997	0.8280	0.6233
XiaoYi	0.6694	0.7618	0.7126	0.6512	0.7023	0.6758
+MedPrompt	0.6899	0.7949	0.7387	0.6693	<u>0.7231</u>	0.6951
+RAG (top-1)	<u>0.7103</u>	0.7788	<u>0.7430</u>	<u>0.6900</u>	0.7070	<u>0.6984</u>
+RAG (top-3)	0.7179	0.7817	0.7484	0.6985	0.7117	0.7051
+MAD	0.6088	<u>0.8223</u>	0.6996	0.6407	0.7316	0.6831
+MDAgents	0.6038	0.8497	0.7059	0.5613	0.7136	0.6284

Table 4: Performance of DeepSeek-R1 and XiaoYi across different strategies on MedFact.

Model	F1 (VC)	F1 (EL)
Qwen2.5-32B-Instruct	0.5990	0.4436
s1.1-32B	0.5941	0.3114
+ budget forcing	0.6002	0.3319
m1-32B-1K	0.6345	0.5082
+ budget forcing	<u>0.6280</u>	<u>0.4926</u>

Table 5: Performance of different models with and without inference-time scaling techniques on MedFact.

5 Analysis

5.1 Inference-time Scaling

We evaluate the potential of budget forcing (Muennighoff et al., 2025). This technique modulates a model’s reasoning process at inference time by either prematurely terminating generation or prolonging it via “Wait” tokens to adjust the computational budget. We focus on two models adapted for this paradigm: s1.1-32B and m1-32B-1K. s1.1-32B is a general reasoning model fine-tuned from Qwen2.5-32B-Instruct on only 1,000 high-quality reasoning examples (Muennighoff et al., 2025). m1-32B-1K is a specialized medical reasoning model fine-tuned from Qwen2.5-32B-Instruct on 1,000 medical question-answering pairs (Huang et al., 2025). Table 5 compares the performance of the baseline model against s1.1-32B and m1-32B-1K under a CoT setting. The results indicate that s1.1-32B, fine-tuned on general-purpose data, suffers a substantial performance degradation on the EL task,

which we attribute to its lack of domain-specific medical knowledge. In contrast, m1-32B-1K, with its medical fine-tuning, outperforms the base model. Applying budget forcing yields no performance gain and instead exacerbates the “over-criticism” phenomenon. The prolonged reasoning process causes models to hallucinate errors, a behavior analogous to the over-thinking observed in reasoning models (Ghosal et al., 2025). This suggests that simply extending a model’s reasoning time without providing new information can lead to counterproductive deliberation, and reinforces the conclusion that for knowledge-intensive tasks like medical fact-checking, enhancing a model’s underlying medical knowledge is more critical.

5.2 Impact of RAG Reference Sources

Beyond techniques that optimize the model’s reasoning, RAG provides a core paradigm for supplementing domain-specific medical knowledge. We evaluate how corpus selection and reference quality affect fact-checking outcomes through controlled experiments comparing authoritative medical sources (peer-reviewed journals, clinical guidelines, and standardized medical literature) with generic web sources. We use the same retrieval pipeline across settings to isolate the effect of reference relevance and authority. As shown in Table 6, Precision improves slightly over zero-shot baselines with curated authoritative sources, but overall performance remains well below that with highly task-relevant references. Recall drops below the zero-shot baseline when using generic authoritative

Model	Precision	Recall	F1 Score
DeepSeek-R1	0.5035	<u>0.7580</u>	0.6051
+ RAG (top-3 from same sources)	0.6112	0.7713	0.6820
+ RAG (top-3 from authoritative sources)	0.5557	0.7069	0.6223
XiaoYi	0.6512	0.7023	0.6758
+ RAG (top-3 from same sources)	0.6985	0.7117	0.7051
+ RAG (top-3 from authoritative sources)	<u>0.6861</u>	0.6796	<u>0.6828</u>

Table 6: Performance of different models with different sources for RAG on MedFact using zero-shot prompting. The best results are **bolded** and the second-best are underlined.

Model	Language	Precision	Recall	F1 Score
Gemini 2.5 Pro	Chinese	0.4828	<u>0.8752</u>	0.6223
	English	0.5286	0.9317	0.6745
Doubao-Seed-1.6-thinking	Chinese	0.6307	0.7344	<u>0.6786</u>
	English	<u>0.5952</u>	0.8483	0.7000

Table 7: Performance comparison between Chinese and English versions of MedFact using CoT prompting. The best results are **bolded** and the second-best are underlined.

texts without task-specific relevance. We attribute this to relevance mismatch: irrelevant or loosely related references degrade both Precision and recall by biasing models toward accepting unverified content as correct, or by misaligning retrieved information with the claim. This points to a risk for industrial RAG deployments in healthcare, where reference corpus quality and relevance vary widely.

5.3 Cross-lingual Evaluation

Beyond the native Chinese setting, we assess the generalizability of our findings and the effect of language on model performance via cross-lingual evaluation on an English-translated version of MedFact. We select two representative models, Doubao-Seed-1.6-thinking and Gemini 2.5 Pro. Table 7 compares performance between the original Chinese and translated English versions under consistent CoT prompting. Both models achieve F1 gains on English, with a larger improvement for Gemini 2.5 Pro (0.6223 to 0.6745). Both also show increased Recall, and Doubao-Seed-1.6-thinking shows decreased Precision. The “over-criticism” tendency observed in Chinese thus persists across languages: models flag potential errors more aggressively in English, and for Doubao-Seed-1.6-thinking this raises false positives despite the F1 gain. Language choice materially affects both overall fact-checking performance and the Precision-Recall trade-off, with implications for multilingual deployment of medical fact-checking systems.

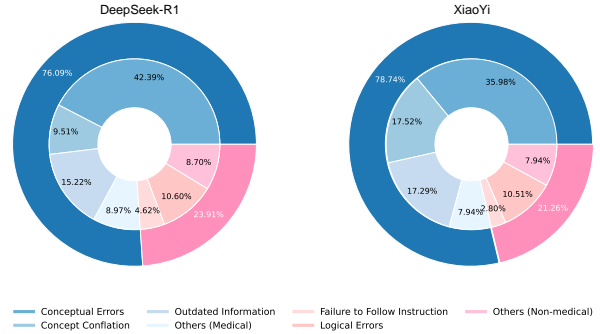


Figure 4: Error distribution of DeepSeek-R1 and XiaoYi on the EL task (zero-shot).

5.4 Data Contamination Analysis

To assess whether evaluated models have memorized MedFact during pre-training, we administer a text-completion probe: each model is prompted with the first half of every instance and generates a continuation, scored against the ground-truth second half via ROUGE-F1. As shown in Table 8, across nine representative open-source and proprietary models, ROUGE-1 F1 stays below 0.155 and ROUGE-L F1 below 0.144. These low overlaps, combined with the proprietary, non-public provenance of the source corpus, support our claim that MedFact is largely unseen by current LLMs.

5.5 Error Analysis

Human experts manually annotated and categorized errors made by top-performing models. As illustrated in Figure 4, errors stemming from insufficient medical knowledge are the predominant cat-

Model	R-1	R-2	R-L	LCS
DeepSeek-R1	0.0923	0.0300	0.0859	0.0458
Qwen3-235B-A22B	0.1286	0.0471	0.1201	0.0456
XiaoYi	0.1236	0.0450	0.1157	0.0448
GPT-4.5	0.1548	0.0549	0.1435	0.0401
o1	0.1449	0.0548	0.1365	0.0442
o3	0.0817	0.0270	0.0767	0.0437
Gemini 2.5 Pro	0.1267	0.0440	0.1176	0.0490
Doubao-Seed-1.6	0.1327	0.0495	0.1246	0.0465
Doubao-Seed-1.6-thinking	0.0819	0.0265	0.0761	0.0455

Table 8: Text-completion probe for data contamination. Reported are ROUGE-1/2/L F1 scores and normalized longest common subsequence (LCS) between the model continuation and the ground-truth continuation. Uniformly low overlaps indicate that MedFact has not been memorized by the evaluated models.

egory (e.g., 76.09% of all errors for DeepSeek-R1). In this category, models demonstrate insufficient understanding of medical principles, conflate distinct conditions or treatments, and rely on outdated information, indicating that they often struggle with the nuanced, specialized knowledge required for accurate medical fact-checking. Within this aggregate gap, three sub-categories warrant attention for downstream deployment. *Outdated-information* errors, such as citation of superseded guidelines or obsolete pharmacological data, are difficult to detect because the surface text remains plausible. *Concept-conflation* errors, in which related conditions or drugs are silently equated, expose limits in fine-grained terminological discrimination. *Logical-inconsistency* errors, in which a model’s rationale and final verdict contradict each other, indicate that surface accuracy can mask shallow reasoning. Together, these categories point to three axes for improvement: knowledge currency, fine-grained discrimination, and reasoning consistency.

5.6 Fine-grained Performance

We conduct a fine-grained analysis of model performance across writing styles (Figure 5). For VC, models identify errors in fabricated medical misinformation more effectively than in encyclopedia texts, indicating that they detect exaggerated falsehoods but struggle with the inaccuracies often present in professionally curated content. For EL, performance varies less across styles, suggesting that localization depends less on stylistic cues and more on medical knowledge. EL thus serves as a more robust measure of domain expertise. This style-dependent VC–EL asymmetry has two implications. First, single-style evaluation risks over-



Figure 5: Zero-shot performance of different models on MedFact across different writing styles.

stating operational capability: a system strong on misinformation-style inputs may fail silently on encyclopedia content, motivating the style-balanced curation in MedFact. Second, the asymmetry is consistent with VC partially exploiting stylistic priors learned during web-scale pre-training, while EL requires committing to a specific erroneous span for which surface cues cannot substitute. For clinical assistance, where source texts skew toward encyclopedia and popular-science styles, EL Precision is the more reliable evaluation target.

6 Conclusion

We introduce MedFact, a diverse, realistic, and uncontaminated benchmark for evaluating LLM fact-checking abilities in Chinese medical texts. Evaluation of 20 LLMs reveals critical performance deficits compared to human experts, particularly on fine-grained error localization. LLMs also exhibit an over-criticism failure mode that significantly degrades Precision. These challenges highlight the need for developing LLMs that are factually reliable for safe medical deployment.

7 Limitations

MedFact targets the Chinese language within China’s healthcare system, and performance may not generalize to other languages, cultures, or healthcare systems. This focus ensures high linguistic quality and cultural consistency, though future work could develop parallel benchmarks for cross-lingual comparison. For the EL task, we use GPT-4o as an automated judge, which enables scalable evaluation but has inherent limitations, including potential biases and inconsistencies. Future work could explore hybrid evaluation frameworks combining LLM judge scalability with expert validation for ambiguous or high-stakes cases. Additionally, MedFact captures medical knowledge at creation time, and as medical science evolves, some information may become outdated. We prioritize foundational medical knowledge to minimize this issue, but acknowledge that dynamic benchmark updates would be valuable in the long term.

8 Ethical Considerations

For data collection and expert verification, we secured Institutional Review Board (IRB) approval and support from our institution’s department. All expert annotators received fair compensation at or above the regional average wage. We removed all Personally Identifiable Information (PII), and data use is strictly limited to non-commercial research and complies with source platform terms under fair use. Because factually incorrect instances could be exploited to train harmful content generators or spread misinformation, we distribute the dataset under a restrictive license that prohibits clinical or patient-facing applications. The documentation warns about factual errors and specifies that the dataset is intended exclusively for research and benchmarking. MedFact covers only Chinese medical texts, and the data, error distributions, and findings may not generalize to other languages, cultures, or healthcare systems. We caution against overly broad conclusions and encourage analogous benchmarks for other languages and contexts.

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A Detailed Related Works

A.1 LLMs in Medical Domains

The capabilities of Large Language Models (LLMs) across many disciplines have prompted the exploration of their applications in the medical domain (Huang et al., 2024). Medprompt (Nori et al., 2023) enhances LLMs’ performance on medical benchmarks by combining self-generated Chain-of-Thought (CoT) (Wei et al., 2022), few-shot learning with dynamic example selection (Liu et al., 2022), and self-consistency (Wang et al., 2023b). Other developments include HuaTuo (Wang et al., 2023a), a LLaMA-based model fine-tuned on Chinese medical instruction data; HuatuoGPT (Zhang et al., 2023), a model specialized for medical consultation, fine-tuned on responses distilled from ChatGPT and real-world data; and PediatricsGPT (Yang et al., 2024), a model developed via a systematic training pipeline for pediatric and general medical applications. These advances highlight a growing interest in adapting LLMs to medical reasoning and the specialized requirements of real-world practice.

A.2 Benchmarking Medical Knowledge in LLMs

Numerous benchmarks have been developed to evaluate the medical knowledge of LLMs (Nguyen et al., 2023; Kweon et al., 2024; Abacha et al., 2025). MedQA (Jin et al., 2021) is a multiple-choice QA dataset derived from the United States Medical Licensing Examinations to assess the clinical knowledge of LLMs. Huatuo-26M (Wang et al., 2025) is a Chinese dataset comprising data from online consultation websites, encyclopedias, and information extracted from knowledge bases. More recently, HealthBench (Arora et al., 2025) is a benchmark of realistic health conversations evaluated with custom, physician-created rubrics. MedXpertQA (Zuo et al., 2025) evaluates expert-level medical knowledge using both textual and multimodal tasks.

While some benchmarks for medical fact-checking exist, they often focus on narrow contexts. VeriFact (Chung et al., 2025) verifies synthetic text against structured Electronic Health Records using a paradigm combining retrieval-augmented generation (RAG) and LLM-as-a-Judge. MEDEC (Abacha et al., 2025) provides a benchmark for error detection and correction, but is confined to clinical notes. Relying on synthetic data or a single text genre, these benchmarks fail to

capture the diverse contexts of medical information encountered in the real world, thereby limiting their utility for assessing how well models generalize. Consequently, a gap remains for a benchmark that can robustly evaluate fact-checking across a wide array of realistic medical texts.

A.3 Benchmarking Factuality in LLMs

Recent research has produced several benchmarks to evaluate factuality in LLMs. For instance, HaluEval (Li et al., 2023) focuses on hallucination detection through a large-scale collection of automatically generated and human-annotated examples. SimpleQA (Wei et al., 2024) measures short-form factuality using single-answer questions adversarially collected to challenge state-of-the-art models like GPT-4. More broadly, OpenFactCheck (Iqbal et al., 2024) proposes a unified framework for benchmarking fact-checking across diverse sources, including free-form text and LLM-generated content. While these benchmarks provide valuable tools for assessing general-domain factuality, they lack the domain-specific nuances required for high-stakes fields like medicine, where misinformation can have severe public health consequences (Wang and Togher, 2024). Addressing this challenge requires a solution that bridges two critical gaps: the lack of domain-specific context in general factuality benchmarks and the lack of real-world diversity in existing medical fact-checking benchmarks. To this end, we introduce MedFact, a new benchmark designed to evaluate the fact-checking capabilities of LLMs on a comprehensive and diverse collection of realistic medical texts.

B Dataset Construction & Statistics

B.1 Multi-criteria Filtering

Across the three filtering rounds, acceptance rates (passed instances over candidate pool size) were 67.69%, 37.00%, and 23.62%. Agreement between the model suite and medical professionals rose across rounds: 69.72%, 84.37%, and 96.40%, as the reference database grew from 412 to 624 instances. Figure 10 presents one accepted example, and Figure 11 presents three rejected examples from the reference database, illustrating the filtering criteria for overly simplistic, esoteric, and malformed content.

B.2 Error Taxonomy Definitions

We define eight fine-grained error types in MedFact, organized into two primary categories: **Medical Errors** and **Non-Medical Errors**. The definitions for each subcategory are detailed below.

Medical Errors Medical errors encompass factually incorrect content related to established medical knowledge, principles, or clinical practice. The definitions of each error type in MedFact are as follows:

- **Conceptual Error:** Incorrect explanations of medical concepts, disease mechanisms, or drug actions; treatment recommendations that contradict established clinical guidelines; or inaccurate medication instructions (e.g., dosage, frequency). This category also encompasses errors in standard reference values for clinical data, such as laboratory test ranges or clinical scoring systems (e.g., GCS, APGAR).
- **Terminological Error:** Use of non-standard, obsolete, or erroneous medical terminology. This includes incorrect translations or mappings between medical terms across different languages (e.g., Chinese and English).
- **Temporal Error:** Errors in the chronological sequence of medical events or processes. Examples include misordering clinical procedures (e.g., administering post-operative medication pre-operatively), misrepresenting disease progression timelines, or describing developmental stages out of sequence.
- **Others (Medical):** A residual category for medical errors not classifiable within the above types. This includes failures to convey critical safety warnings, flawed clinical reasoning (e.g., broken causal chains between symptoms and diagnoses), or misrepresentation of risk factors.

Non-Medical Errors Non-medical errors encompass factual inaccuracies that are not specific to the medical domain.

- **Citation and Sourcing Error:** Fabrication or misrepresentation of sources, including citing non-existent literature, providing inaccurate citation details, or inventing data sources.
- **Biased Content Error:** Content that reflects or promotes bias by perpetuating stereotypes

related to social identity in diagnoses or treatment recommendations, or by employing language that reinforces social prejudice.

- **General Factual Error:** Factual inaccuracies in non-medical background information, encompassing errors related to history, geography, basic scientific principles, or general world knowledge.
- **Others (Non-Medical):** A residual category for other non-medical issues, including ethical or legal violations (e.g., privacy breaches, suggesting illegal acts), undisclosed commercial promotion, or severe linguistic incoherence that fundamentally obstructs comprehension.

B.3 Writing Style Taxonomy Definitions

We categorize the writing styles of MedFact into four distinct types: encyclopedia-style articles, popular science journalism, user-generated web content, and fabricated misinformation:

- **Encyclopedia-style:** Formal content characteristic of medical texts, featuring specialized terminology and structured presentation.
- **Popular Science Journalism:** Articles that translate complex medical topics for lay audiences, employing simplified language, narrative elements, and references to purported experts to establish credibility.
- **User-generated Web Content:** Informal medical discussions sourced from online Q&A platforms, characterized by colloquial language and personal anecdotes.
- **Fabricated Misinformation:** Deliberately false or misleading medical content that employs exaggerated claims and distorts facts, featuring sensationalized language, cherry-picked data, and conspiracy theories while mimicking legitimate sources.

B.4 Data Statistics

Tables 1 and 2 present the data distribution across different error types and difficulty levels, respectively. Difficulty levels are determined by model performance.

B.5 Data Contamination

To investigate potential data contamination within the pre-training corpora of the evaluated LLMs, we

Model	Full Name
II-Medical-8B	Intelligent-Internet/II-Medical-8B
HuatuogPT-o1-7B	FreedomIntelligence/HuatuogPT-o1-7B
DeepSeek-R1	deepseek-ai/DeepSeek-R1-0528
DeepSeek-V3	deepseek-ai/DeepSeek-V3-0324
Qwen2.5-72B-Instruct	Qwen/Qwen2.5-72B-Instruct
Qwen3-235B-A22B	Qwen/Qwen3-235B-A22B
DeepSeek-R1-Distill-Llama-70B	deepseek-ai/DeepSeek-R1-Distill-Llama-70B
DeepSeek-R1-Distill-Qwen-32B	deepseek-ai/DeepSeek-R1-Distill-Qwen-32B
XiaoYi	xiaoyi-2025-06-24
GPT-4o	gpt-4o-2024-11-20
GPT-4.5	gpt-4.5-preview-2025-02-27
o1	o1-2024-12-17
o3	o3-2025-04-16
Claude 3.7 Sonnet	claude-3-7-sonnet-20250219
Gemini 2.5 Flash	gemini-2.5-flash
Gemini 2.5 Pro	gemini-2.5-pro
Grok-4	grok-4-0709
Qwen2.5-Max	Qwen2.5-Max-2025-01-25
ERNIE-X1	ernie-x1-32k-preview
Doubao-Seed-1.6	doubao-seed-1.6
Doubao-Seed-1.6-thinking	doubao-seed-1.6-thinking

Table 9: Model versions and full names of the evaluated models.

devised a text-completion task. For each instance in MedFact, we prompted the models with the first half of the text and tasked them with generating the continuation. We then measured the textual overlap between the generated output and the ground-truth second half using ROUGE-F1 scores, where a high score would suggest that the model had memorized the content. As shown in Table 8, all evaluated models exhibit negligible ROUGE scores, which strongly indicates that MedFact serves as a previously unseen benchmark.

B.6 Data Examples

Figures 14 to 17 present examples for each medical error. Figures 18 to 21 present examples for each non-medical error. Figures 22 to 25 present examples for each writing style.

C Implementation Details

C.1 Prompt Templates

Figures 12 to 13 present the prompts used for zero-shot and CoT prompting. All prompts were originally formulated in Chinese; we provide their corresponding English translations for reference.

C.2 Model Versions

We accessed proprietary models through API calls and deployed open-source models locally. Table 9 lists the model versions and full names.

C.3 LLM-as-a-Judge

For the evaluation of EL tasks, we assessed the agreement between different models and human experts. DeepSeek-R1, GPT-4o, o1, Claude 3.7 Sonnet, and Gemini 2.5 Pro achieved Cohen’s κ values of 0.800, 0.870, 0.870, 0.845, and 0.865, respectively, on a random 10% sample of the veracity classification task results from Doubao-Seed-1.6-thinking, XiaoYi, and Qwen2.5-Max. Considering API costs and evaluation performance, we selected GPT-4o for the LLM-as-a-Judge evaluation.

D Experimental Results

D.1 Full Result Tables

We present the complete results of our main experiments in Tables 10 and 11 and Figures 6 and 7. The results from experiments using advanced evaluation strategies and inference-time scaling are provided in Tables 12 and 13, respectively.

Model	Zero-shot			CoT		
	Precision	Recall	F1 Score	Precision	Recall	F1 Score
Human	0.7695	0.7353	0.7521	–	–	–
Open-source						
II-Medical-8B	0.5687	0.7216	0.6361	0.5724	0.7459	0.6477
Huatuogpt-o1-7B	0.6004	0.5668	0.5831	0.6185	0.5699	0.5932
DeepSeek-R1	0.5488	0.9101	0.6847	0.5360	0.9163	0.6764
DeepSeek-V3	0.6883	0.6057	0.6444	0.6006	0.7636	0.6724
Qwen2.5-72B-Instruct	0.8264	0.3788	0.5195	0.7320	0.5686	0.6400
Qwen3-235B-A22B	0.6720	0.7183	0.6944	0.6949	0.6049	0.6468
DeepSeek-R1-Distill-Llama-70B	0.5451	0.8947	0.6774	0.5490	0.9220	0.6882
DeepSeek-R1-Distill-Qwen-32B	<u>0.7204</u>	0.4480	0.5524	0.7194	0.4744	0.5718
Proprietary						
XiaoYi	0.6694	0.7618	<u>0.7126</u>	0.6631	0.7552	0.7061
GPT-4o	0.5842	0.7968	0.6741	0.5646	0.8044	0.6635
GPT-4.5	0.6108	0.8100	0.6965	0.6254	0.7826	0.6952
o1	0.7155	0.6323	0.6713	<u>0.7205</u>	0.6456	0.6810
o3	0.5596	0.8960	0.6890	0.5507	0.9128	0.6870
Claude 3.7 Sonnet	0.6063	0.8006	0.6900	0.6021	0.8197	0.6943
Gemini 2.5 Flash	0.5369	<u>0.9225</u>	0.6787	0.5240	<u>0.9405</u>	0.6730
Gemini 2.5 Pro	0.5067	0.9707	0.6658	0.5082	0.9688	0.6667
Grok-4	0.5785	0.8705	0.6951	0.5789	0.8563	0.6908
Qwen2.5-Max	0.6873	0.7146	0.7006	0.6031	0.8175	0.6942
ERNIE-X1	0.6210	0.7495	0.6792	0.6643	0.7116	0.6871
Doubao-Seed-1.6	0.6086	0.8582	0.7122	0.5979	0.8459	0.7006
Doubao-Seed-1.6-thinking	0.6711	0.7625	0.7139	0.6437	0.7791	<u>0.7050</u>

Table 10: Veracity classification performance of human experts and models on MedFact in zero-shot and CoT settings. The best results are **bolded** and the second-best are underlined.

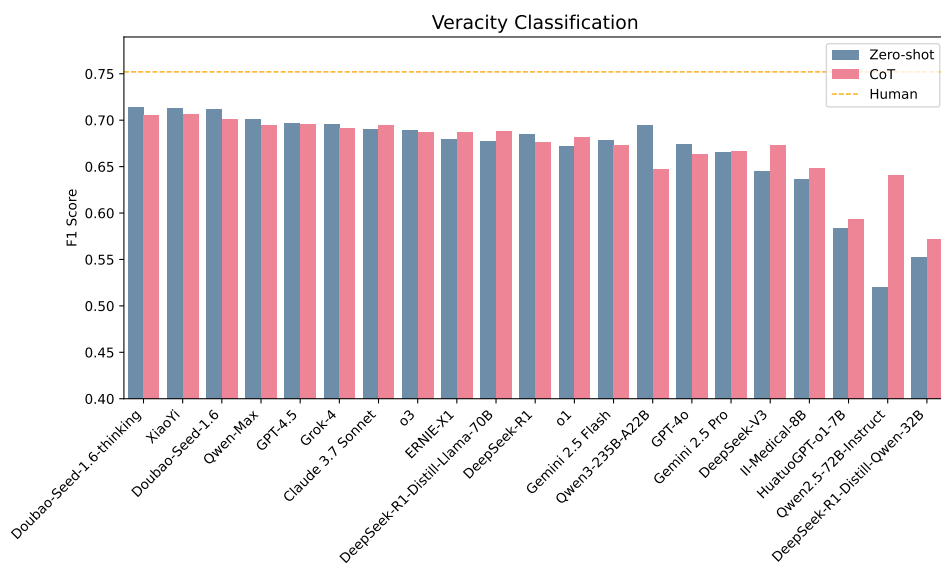


Figure 6: Veracity classification performance of human experts and models on MedFact in zero-shot and CoT settings.

Model	Zero-shot			CoT		
	Precision	Recall	F1 Score	Precision	Recall	F1 Score
Human	0.7495	0.6588	0.7012	–	–	–
Open-source						
II-Medical-8B	0.3278	0.2618	0.2911	0.2904	0.2240	0.2529
HuatuoGPT-o1-7B	0.3054	0.1654	0.2146	0.3508	0.1900	0.2465
DeepSeek-R1	0.5035	0.7580	0.6051	0.5012	0.7826	0.6111
DeepSeek-V3	0.5832	0.3809	0.4608	0.5266	0.5510	0.5386
Qwen2.5-72B-Instruct	0.8024	0.3223	0.4599	<u>0.6731</u>	0.4282	0.5234
Qwen3-235B-A22B	0.6234	0.5803	0.6011	<u>0.6565</u>	0.5076	0.5725
DeepSeek-R1-Distill-Llama-70B	0.4990	0.7410	0.5964	0.5142	0.7873	0.6221
DeepSeek-R1-Distill-Qwen-32B	0.6648	0.3450	0.4543	0.6480	0.3393	0.4454
Proprietary						
XiaoYi	0.6512	0.7023	0.6758	0.6530	0.7221	0.6858
GPT-4o	0.4966	0.5595	0.5262	0.5012	0.6144	0.5520
GPT-4.5	0.5694	0.6824	0.6208	0.5971	0.6947	0.6422
o1	<u>0.6921</u>	0.5652	0.6223	0.6975	0.5775	0.6319
o3	<u>0.5355</u>	<u>0.8129</u>	0.6456	0.5579	<u>0.8658</u>	0.6785
Claude 3.7 Sonnet	0.5242	0.5728	0.5474	0.5567	0.6777	0.6113
Gemini 2.5 Flash	0.4988	0.7921	0.6121	0.4927	0.8299	0.6183
Gemini 2.5 Pro	0.4689	0.8346	0.6005	0.4828	0.8752	0.6223
Grok-4	0.2675	0.2316	0.2482	0.2136	0.1692	0.1888
Qwen2.5-Max	0.6113	0.5113	0.5569	0.5663	0.6219	0.5928
ERNIE-X1	0.5580	0.5775	0.5676	0.6240	0.5945	0.6089
Doubao-Seed-1.6	0.5566	0.6928	0.6173	0.5609	0.7268	0.6332
Doubao-Seed-1.6-thinking	0.6501	0.6938	<u>0.6712</u>	0.6307	0.7344	<u>0.6786</u>

Table 11: Error localization performance of human experts and models on MedFact in zero-shot and CoT settings. The best results are **bolded** and the second-best are underlined.

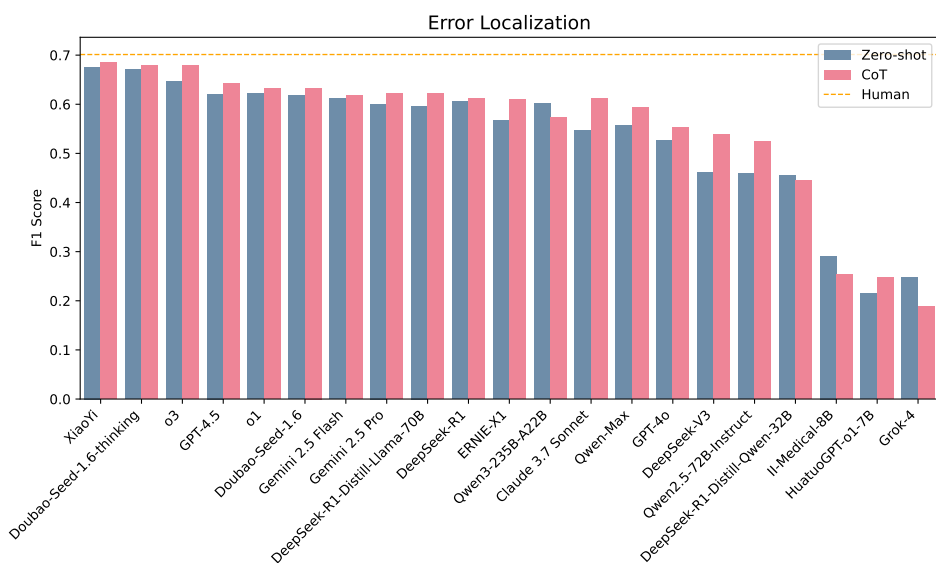


Figure 7: Error localization performance of human experts and models on MedFact in zero-shot and CoT settings.

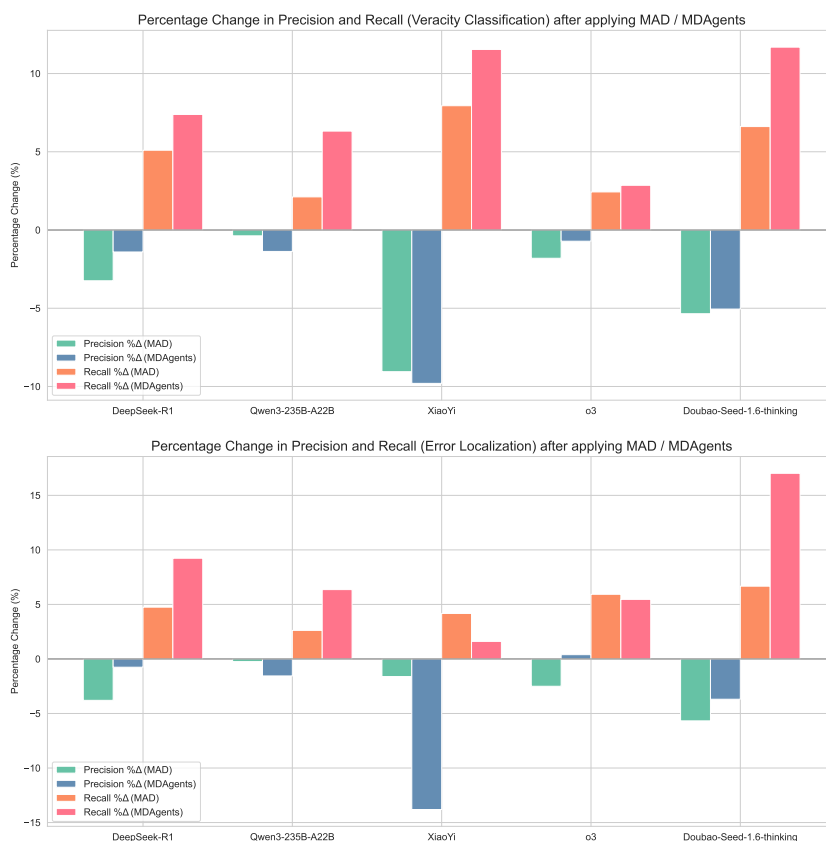


Figure 8: Changes in precision and recall after applying the MAD and MDAgents frameworks.

D.2 Fine-grained Performance

We conduct a fine-grained analysis of model performance across various error types, medical specialties, and writing styles (Figure 9). For VC, models are more effective at identifying errors in fabricated medical misinformation than in encyclopedia texts, indicating that they can readily detect exaggerated falsehoods but struggle with the subtle, nuanced inaccuracies often present in professionally curated content. For EL, by contrast, performance varies less across styles, suggesting that localization is less influenced by stylistic cues and depends more fundamentally on underlying medical knowledge. Consequently, EL serves as a more robust measure of actual domain expertise.

D.3 Data Contamination

Table 8 presents the results of our data contamination analysis for the text-completion experiment.

E Case Studies

We categorize the observed errors using the following typology:

- **Conceptual Errors:** Fundamental misunderstanding of medical principles, such as incorrectly identifying a disease’s etiology or misinterpreting mechanisms.
- **Concept Conflation:** Conflation of distinct but related medical concepts, such as mistaking the symptoms of one disease for those of a similar-presenting condition, or confusing two drugs with similar names but different therapeutic effects.
- **Outdated Information:** Reliance on information that is no longer current, including citation of superseded clinical guidelines, obsolete treatment protocols, or outdated pharmacological data.
- **Others (Medical):** Domain-specific errors not captured by the preceding categories, such as dosage miscalculations, inappropriate procedural indications, or misinterpretation of diagnostic criteria.
- **Failure to Follow Instructions:** Non-adherence to prompt specifications, such as



Figure 9: Performance breakdown of different models on MedFact in the zero-shot setting. The radar charts illustrate model performance across three key dimensions: error type, medical specialty, and textual style.

generating output in a format inconsistent with the given instructions.

- **Logical Errors:** Errors in reasoning where a model’s explanation for its judgment is internally inconsistent or contains logical contradictions.
- **Others (Non-Medical):** General errors unrelated to medical expertise, such as grammatical mistakes, factual inaccuracies in non-medical information, or other fundamental reasoning flaws.

Figures 26 and 27 present successful fact-checking cases. Figures 28 to 41 present case studies for each error category. We further illustrate the “correct-for-the-wrong-reason” and “over-criticism” phenomena with case studies in Figures 42 to 46.

Accepted Example

Text: 空腹血糖正常范围为3.9-6.1mmol/L，因此空腹血糖7.5mmol/L偏高。针对这种情况，推荐以下治疗方案：1. 调整饮食：控制碳水化合物的摄入量，增加蔬菜、水果、全谷类食物的摄入，避免高糖、高脂、高盐的食物。2. 运动：适当的运动可以帮助降低血糖，每天进行30分钟以上的有氧运动，如快走、慢跑、游泳等。3. 药物治疗：如果饮食和运动控制不足以降低血糖，可以考虑口服药物治疗。常用的药物包括二甲双胍、磺脲类药物等。如果同时出现以下症状，需要警惕并前往医院：频繁口渴、多尿、视力模糊、乏力、容易感染等。这些症状可能是糖尿病的表现，需要及时就医。空腹血糖偏高，建议采取饮食控制、运动和药物治疗相结合的综合治疗方案，同时注意观察症状变化，及时就医。*(The normal range for fasting blood glucose is 3.9-6.1 mmol/L; therefore, a fasting blood glucose of 7.5 mmol/L is elevated. For this condition, the following treatment regimen is recommended: 1. Dietary modification: Control carbohydrate intake, increase consumption of vegetables, fruits, and whole grain foods, and avoid high-sugar, high-fat, and high-sodium foods. 2. Exercise: Appropriate exercise can help lower blood glucose levels. Engage in more than 30 minutes of aerobic exercise daily, such as brisk walking, jogging, or swimming. 3. Pharmacological therapy: If dietary and exercise interventions are insufficient to reduce blood glucose levels, oral medication therapy may be considered. Commonly used medications include metformin and sulfonylurea agents. If the following symptoms occur concurrently, vigilance is required and hospital consultation is necessary: frequent thirst, polyuria, blurred vision, fatigue, and increased susceptibility to infections. These symptoms may indicate diabetes mellitus and require prompt medical attention. For elevated fasting blood glucose, a comprehensive treatment approach combining dietary control, exercise, and pharmacological therapy is recommended, while monitoring symptom changes and seeking timely medical care.)*

Label: Accepted

Feedback: 该文本质量良好，符合质量标准。内容结构清晰，首先明确了空腹血糖正常范围(3.9-6.1mmol/L)并准确判断患者血糖水平。治疗方案涵盖饮食调整、运动疗法和药物治疗三个层面，具体建议操作性强，并加入了症状监测和就医指导，体现了临床实践的完整性。医学知识准确，表达简洁明了，既有专业性又便于理解，为临床决策提供了有价值的参考。*(This text is of good quality and meets quality standards. The content structure is clear, first establishing the normal range for fasting blood glucose (3.9-6.1 mmol/L) and accurately assessing the patient's blood glucose level. The treatment regimen covers three levels: dietary modification, exercise therapy, and pharmacological treatment. The specific recommendations are highly actionable, and the inclusion of symptom monitoring and medical consultation guidance demonstrates the completeness of clinical practice. The medical knowledge is accurate, and the expression is concise and clear, combining professionalism with accessibility, providing valuable reference for clinical decision-making.)*

Figure 10: An example of accepted data with corresponding professional feedback.

Model	Veracity Classification			Error Localization		
	Precision	Recall	F1 Score	Precision	Recall	F1 Score
Open-source						
DeepSeek-R1	0.5488	0.9101	0.6847	0.5035	0.7580	0.6051
+MedPrompt	0.5657	0.9036	0.6958	0.5221	0.7580	0.6184
+RAG (top-1)	<u>0.6189</u>	0.8658	<u>0.7218</u>	<u>0.5892</u>	0.7647	<u>0.6656</u>
+RAG (top-3)	0.6393	0.8696	0.7369	0.6112	0.7713	0.6820
+MAD	0.5310	<u>0.9565</u>	0.6829	0.4844	<u>0.7940</u>	0.6017
+MDAgents	0.5411	0.9773	0.6965	0.4997	0.8280	0.6233
Qwen3-235B-A22B	0.6720	0.7183	0.6944	0.6234	0.5803	0.6011
+MedPrompt	0.6540	<u>0.7344</u>	0.6919	0.6233	0.6427	0.6329
+RAG (top-1)	0.8380	0.5964	0.6969	0.8222	0.5331	<u>0.6468</u>
+RAG (top-3)	<u>0.7646</u>	0.6938	0.7275	<u>0.7466</u>	<u>0.6295</u>	0.6831
+MAD	<u>0.6695</u>	0.7335	0.7000	0.6219	0.5955	0.6084
+MDAgents	0.6628	0.7637	<u>0.7097</u>	0.6137	0.6172	0.6155
Proprietary						
XiaoYi	0.6694	0.7618	0.7126	0.6512	0.7023	0.6758
+MedPrompt	0.6899	0.7949	0.7387	0.6693	<u>0.7231</u>	0.6951
+RAG (top-1)	<u>0.7103</u>	0.7788	<u>0.7430</u>	<u>0.6900</u>	0.7070	<u>0.6984</u>
+RAG (top-3)	0.7179	0.7817	0.7484	0.6985	0.7117	0.7051
+MAD	0.6088	<u>0.8223</u>	0.6996	0.6407	0.7316	0.6831
+MDAgents	0.6038	0.8497	0.7059	0.5613	0.7136	0.6284
o3	0.5596	0.8960	0.6890	0.5355	0.8129	0.6456
+MedPrompt	0.6357	0.7883	0.7038	0.6126	0.7146	0.6597
+RAG (top-1)	0.6152	0.8658	<u>0.7193</u>	0.6013	0.8166	0.6926
+RAG (top-3)	<u>0.6202</u>	0.8658	0.7227	<u>0.6024</u>	0.8034	<u>0.6885</u>
+MAD	0.5495	<u>0.9178</u>	0.6874	0.5221	0.8611	0.6500
+MDAgents	0.5556	0.9216	0.6932	0.5376	<u>0.8573</u>	0.6608
Doubao-Seed-1.6-thinking	0.6711	0.7625	0.7139	0.6501	0.6938	0.6712
+MedPrompt	0.6786	0.7543	0.7144	0.6628	0.7023	0.6820
+RAG (top-1)	<u>0.7680</u>	0.7164	<u>0.7413</u>	<u>0.7595</u>	0.6834	0.7194
+RAG (top-3)	0.7695	0.7178	0.7428	0.7605	0.6815	<u>0.7188</u>
+MAD	0.6352	<u>0.8129</u>	0.7131	0.6132	<u>0.7401</u>	0.6707
+MDAgents	0.6372	0.8516	0.7290	0.6261	0.8119	0.7070

Table 12: Performance of different models across different strategies on MedFact. For each model, the best results are **bolded** and the second-best are underlined.

Model	Veracity Classification			Error Localization		
	Precision	Recall	F1 Score	Precision	Recall	F1 Score
Qwen2.5-32B-Instruct	0.7192	0.5132	0.5990	0.6307	0.3422	0.4436
s1.1-32B	0.6378	0.5560	0.5941	0.4369	0.2420	0.3114
+ budget forcing	0.5120	0.7250	0.6002	0.3275	0.3365	0.3319
m1-32B-1K	<u>0.6540</u>	0.6163	0.6345	<u>0.5808</u>	<u>0.4518</u>	0.5082
+ budget forcing	0.5953	<u>0.6645</u>	<u>0.6280</u>	0.5122	0.4745	<u>0.4926</u>

Table 13: Performance of different models with and without inference-time scaling (budget forcing) on MedFact. The best results are **bolded** and the second-best are underlined.

Rejected Example (Overly Simplistic)

Text: 进行甲状腺功能一般是由护士帮抽血，大概只需要1分钟时间，会存在短暂的疼痛。(Thyroid function testing typically involves blood draw performed by a nurse, which takes approximately 1 minute and involves brief pain.)

Label: Rejected

Feedback: 该文本医学知识含量严重不足。文本仅描述甲状腺功能检查的基本操作流程(抽血、时间、疼痛感)，但完全缺乏核心医学内容。未涉及检查的适应症、禁忌症、检测指标、正常值范围、临床意义、结果解读等关键信息，无法提供实用的专业价值。(This text demonstrates severely inadequate medical knowledge content. The text merely describes the basic operational procedure for thyroid function testing (blood draw, duration, pain sensation), but completely lacks core medical content. It fails to address key information such as indications, contraindications, laboratory parameters, normal reference ranges, clinical significance, and result interpretation, thereby providing no practical professional value.)

Rejected Example (Esoteric)

Text: 《素问玄机原病式》：“诸涩枯涸，干劲皴揭，皆属于燥”，所以诊断不难。因为燥之为物，诚如《张氏医通》所谓：“偏助狂火而损其阴，阴中伏火，日渐煎熬，血液衰耗，使燥气失润而为诸病。在外则皮肤皴揭，在上则咽鼻生干”。《类证治裁》：“燥为阳明秋金之化，金燥则水源竭而灌溉不固”。至于致燥的原因，林氏又称，“燥有外因，有内因。因乎外者，天气肃而燥胜，或风热致伤气分，则津液不腾。因乎内者，精血夺而燥生。或服饵偏助阳火，则化原日涸”。(The Suwen Xuanji Yuanbingshi states: “All astringency, withering, dryness, tautness, chapping, and peeling are attributed to dryness,” making the diagnosis straightforward. As dryness by nature, as described in Zhang’s Medical Comprehensive Guide: “It particularly assists pathogenic fire and damages yin, with latent fire within yin gradually decocting and consuming blood and fluids, causing dryness qi to lose moisture and manifest as various diseases. Externally, it causes skin chapping and peeling; in the upper body, it causes dryness in the throat and nose.” The Systematic Differentiation and Treatment states: “Dryness is the transformation of Yangming autumn metal; when metal becomes dry, the water source is exhausted and irrigation fails.” Regarding the causes of dryness, Lin also notes: “Dryness has external and internal causes. External causes involve severe dry weather with dryness predominating, or wind-heat damaging the qi aspect, preventing fluid circulation. Internal causes involve depletion of essence and blood generating dryness, or taking medications that excessively support yang fire, causing the transformative source to gradually dry up.”)

Label: Rejected

Feedback: 该文本存在严重的可读性问题。大量古文引用和中医学语堆砌，如“诸涩枯涸，干劲皴揭”等，缺乏现代语言解释。句式冗长复杂，逻辑跳跃频繁，从病理机制突然转向治疗方法。专业术语密集但缺乏定义，如“母子同病”等概念模糊。整体表达晦涩难懂，普通读者难以理解，即使专业人士也需反复阅读才能把握要点。(This text presents serious readability issues. Extensive classical Chinese quotations and accumulated Traditional Chinese Medicine (TCM) terminology, such as “zhuse kuhao, ganjin cunqie” (all astringency, withering, dryness, tautness, chapping, and peeling), lack modern linguistic explanations. The sentence structures are lengthy and complex, with frequent logical leaps, abruptly transitioning from pathological mechanisms to treatment methods. Professional terminology is dense but lacks definitions, with concepts such as “mother-child concurrent disease” remaining vague. The overall expression is obscure and difficult to comprehend, making it challenging for general readers to understand, and even requiring medical professionals to read repeatedly to grasp the key points.)

Rejected Example (Malformed Content)

Text: 1.外伤性疾病。(1)急性损伤：如腰椎骨折，脱位或腰肌软组织损伤。(2)慢性损伤：如工作时的不良体位，慢性累积性损伤。2.炎症性疾病。(1)感染性疾病：如结核菌、化脓菌或伤寒菌侵犯腰部及软组织。(2)无菌性炎症：如骨及软组织炎症。3.退行性变如胸腰椎的退行性疾病。4.先天性疾患常见的有隐性脊柱裂、腰椎骶化或骶椎腰化、漂浮棘突、发育性椎管狭窄和椎体畸形等。5.肿瘤性疾病。如原发性或转移性肿瘤，对胸腰椎及软组织的侵犯。6.腰背部软组织病变。腰背部组织自外向内包括皮肤、皮下组织、肌肉、韧带、脊椎、肋骨和脊髓，上述任何组织的病变均可引起腰背痛。(Traumatic diseases. (1) Acute injuries: such as lumbar vertebral fractures, dislocations, or lumbar muscle soft tissue injuries. (2) Chronic injuries: such as poor posture at work and chronic cumulative strain injuries. Inflammatory diseases. (1) Infectious diseases: such as invasion of the lumbar region and soft tissues by tuberculosis bacteria, pyogenic bacteria, or typhoid bacteria. (2) Aseptic inflammation: such as bone and soft tissue inflammation. Degenerative changes such as degenerative diseases of the thoracolumbar spine. Congenital disorders commonly include spina bifida occulta, lumbarization of sacral vertebrae or sacralization of lumbar vertebrae, floating spinous processes, developmental spinal stenosis, and vertebral malformations. Neoplastic diseases such as primary or metastatic tumors invading the thoracolumbar spine and soft tissues. Lumbar and back soft tissue lesions. The lumbar and back tissues from superficial to deep include skin, subcutaneous tissue, muscles, ligaments, vertebrae, ribs, and spinal cord. Pathological changes in any of these tissues can cause low back pain.)

Label: Rejected

Feedback: 该文本存在明显的结构缺陷，缺少段落主体内容。全文仅为分类列举，如“1.外伤性疾病”、“2.炎症性疾病”等，整体呈现为骨架式框架，缺乏实质性医学知识展开。这种纯列表式表达无法为读者提供充分的专业信息，不符合质量标准。(This text exhibits obvious structural deficiencies, lacking substantial paragraph content. The entire text consists merely of categorical enumeration, such as “1. Traumatic diseases,” “2. Inflammatory diseases,” etc., presenting an overall skeletal framework that lacks substantive medical knowledge development. This purely list-based presentation fails to provide readers with adequate professional information and does not meet quality standards.)

Figure 11: Examples of rejected data with corresponding professional feedback.

Prompt for the Zero-shot Setting

你是一位顶尖的医学事实核查专家，以严谨、客观、精准以及高标准的专业判断著称。你的核心任务是审核医学相关文本，识别其中任何可能存在的医学或非医学事实性错误，包括那些边界不清或容易被忽略的细节性错误。

****审核流程:****

1. ****通读文本内容:**** 理解文本的医学相关含义与论述重点;
2. ****错误识别:**** 判断文本是否存在错误;
3. ****最终判断:**** 综合以上分析，给出最终的“正确”或“错误”判断，并在解释中说明依据。

****你的输出必须严格遵循以下格式，不得添加任何额外信息:****

...

审核结果: [错误/正确]

解释: [请在此处提供详细解释]

...

****待审核的医学文本:****

{medical_text}

You are a top-tier medical fact-checking expert, renowned for your rigorous, objective, precise, and high-standard professional judgment. Your core mission is to review medical-related texts, identifying any potential medical or non-medical factual errors within them, including those boundary-unclear or easily overlooked detailed errors.

****Review Process:****

1. ****Read through the text content:**** Understand the medical-related meaning and key arguments of the text;
2. ****Error identification:**** Determine whether the text contains errors;
3. ****Final judgment:**** Based on the above analysis, provide a final judgment of "Correct" or "Incorrect" and explain the rationale in your explanation.

****Your output must strictly follow the format below, without adding any additional information:****

...

Review Result: [Incorrect/Correct]

Explanation: [Please provide detailed explanation here]

...

****Medical text to be reviewed:****

{medical_text}

Figure 12: Prompt template used for zero-shot prompting.

Prompt for the CoT Setting

你是一位顶尖的医学事实核查专家，以严谨、客观、精准以及高标准的专业判断著称。你的核心任务是审核医学相关文本，识别其中任何可能存在的医学或非医学事实性错误，包括那些边界不清或容易被忽略的细节性错误。你将接受一个医学文本，请你分析文本中的信息，明确每一步的判断依据，最终给出结论。

****审核流程:****

1. ****通读文本内容:**** 理解文本的医学相关含义与论述重点;
2. ****错误识别:**** 判断文本是否存在错误;
3. ****最终判断:**** 综合以上分析，给出最终的“正确”或“错误”判断，并在解释中说明依据。

****你的输出必须严格遵循以下格式，不得添加任何额外信息:****

...

思考过程: [你的分析过程]

审核结果: [错误/正确]

解释: [请在此处提供详细解释]

...

****待审核的医学文本:****

{medical_text}

You are a top-tier medical fact-checking expert, renowned for your rigorous, objective, precise, and high-standard professional judgment. Your core mission is to review medical-related texts, identifying any potential medical or non-medical factual errors within them, including those boundary-unclear or easily overlooked detailed errors.

****Review Process:****

1. ****Read through the text content:**** Understand the medical-related meaning and key arguments of the text;
2. ****Error identification:**** Determine whether the text contains errors;
3. ****Final judgment:**** Based on the above analysis, provide a final judgment of "Correct" or "Incorrect" and explain the rationale in your explanation.

****Your output must strictly follow the format below, without adding any additional information:****

...

Thinking Process: [Your analysis process]

Review Result: [Incorrect/Correct]

Explanation: [Please provide detailed explanation here]

...

****Medical text to be reviewed:****

{medical_text}

Figure 13: Prompt template used for CoT prompting.

Medical Conceptual Error

Text: 白细胞异常是指白细胞数量超出正常范围。成人白细胞的参考值通常为 $(4 \sim 10) \times 10^9/L$ ，当白细胞水平超过这一范围时，被称为白细胞增多症 (leukocytosis)。这种情况经常见于炎症反应、组织损伤、溶血、急性中毒，以及高温、严寒、情绪波动或剧烈运动的影响下。**白细胞减少症 (leukopenia)** 是一种常见的血液系统疾病，指成人外周血中白细胞的绝对计数持续低于 $2 \times 10^9/L$ ，多发生于病毒感染或接受放射治疗及化学治疗后。(Leukocyte abnormality refers to a white blood cell count that is outside the normal range. The reference value for white blood cells in adults is typically $(4 \sim 10) \times 10^9/L$; when the white blood cell level exceeds this range, it is called leukocytosis. This condition is often seen in inflammatory reactions, tissue injury, hemolysis, and acute poisoning, as well as under the influence of high temperatures, severe cold, emotional fluctuations, or strenuous exercise. **Leukopenia is a common hematologic disorder, referring to an absolute white blood cell count in adult peripheral blood being persistently below $2 \times 10^9/L$, mostly occurring following viral infections or radiotherapy and chemotherapy.**)

Label: Incorrect

Correction: $2 \times 10^9/L \rightarrow 4 \times 10^9/L$

Figure 14: A data example of an error categorized as medical conceptual error.

Medical Terminological Error

Text: 药物治疗是消化性溃疡的重要治疗手段，常用药物根据具体的作用分为：1. 抑酸治疗药，质子泵抑制剂如奥美拉唑、雷贝拉唑是常用药物，可明显减少胃酸分泌，缓解症状，促进溃疡愈合。2. 保护胃黏膜的药物，代表药物有胶体铋剂、硫糖铝（又称碳酸铝镁）、瑞巴派特、替普瑞酮等。3. 对于合并幽门螺杆菌感染的患者，应联合抗菌药如克拉霉素、阿莫西林、甲硝唑、呋喃唑酮等进行药物治疗，可以提高溃疡愈合质量，减少复发，常用方案为四联疗法即一种质子泵抑制剂+一种铋剂+两种抗菌药。（Drug therapy is an important treatment for peptic ulcer, and commonly used drugs are divided according to their specific actions into: 1. Acid-suppressive therapy drugs; proton pump inhibitors such as omeprazole and rabeprazole are commonly used drugs, which can significantly reduce gastric acid secretion, alleviate symptoms, and promote ulcer healing. 2. Drugs that protect the gastric mucosa; representative drugs include colloidal bismuth, sucralfate (also known as magnesium aluminum carbonate), rebamipide, teprenone, etc. 3. For patients with concomitant *Helicobacter pylori* infection, combination therapy with antimicrobial drugs such as clarithromycin, amoxicillin, metronidazole, furazolidone, etc. should be administered, which can improve the quality of ulcer healing and reduce recurrence; the commonly used regimen is quadruple therapy, i.e., one proton pump inhibitor + one bismuth agent + two antimicrobial drugs.)

Label: Incorrect

Correction: 硫糖铝（又称碳酸铝镁）(sucralfate (also known as magnesium aluminum carbonate)) → 硫糖铝(sucralfate)

Figure 15: A data example of an error categorized as medical terminological error.

Medical Temporal Error

Text: 为了预防胎盘早剥，可以采取以下措施：首先，应完善孕产妇的三级保健体系，积极预防和控制妊娠期高血压疾病、慢性高血压及肾脏问题。其次，在引产过程中需要注意：进行外转胎位术时，操作要轻柔；在进行羊膜穿刺时，应借助B超引导以避免刺中胎盘；**同时，在宫缩前应尽量早实施人工破膜。**此外，应提倡孕妇在妊娠后期或分娩阶段适度活动，避免长时间平躺及腹部受伤；若出现突然的腹部剧痛或阴道出血，应立即就医处理。如果确诊胎盘早剥，需要迅速终止妊娠，并尽可能在胎盘早剥发生6小时内完成分娩。（To prevent placental abruption, the following measures can be taken: Firstly, the three-tier maternal and perinatal healthcare system should be improved to actively prevent and control hypertensive disorders of pregnancy, chronic hypertension, and renal problems. Secondly, during the process of labor induction, attention should be paid: when performing an external cephalic version, the manipulation should be gentle; when performing amniocentesis, it should be guided by B-scan ultrasound to avoid puncturing the placenta; **at the same time, artificial rupture of membranes should be performed as early as possible before uterine contractions.** In addition, pregnant women should be encouraged to engage in moderate activity during late pregnancy or labor and to avoid prolonged supine positions and abdominal injury; if there is a sudden onset of severe abdominal pain or vaginal bleeding, immediate medical attention should be sought. If placental abruption is diagnosed, the pregnancy needs to be terminated promptly, and delivery should be completed within 6 hours of the onset of placental abruption if possible.)

Label: Incorrect

Correction: 宫缩前 (before uterine contractions) → 宫缩间歇期 (during the interval between contractions)

Figure 16: A data example of an error categorized as medical temporal error.

Others (Medical)

Text: 孕酮低的情况应当引起重视，因为它可能与多种健康问题相关，例如卵巢功能障碍、多囊卵巢综合征等。解决孕酮低的方法主要包括以下几个方面：1. 医疗咨询与检查：首先，**建议及时就医，由内分泌科医生进行专业评估。医生可能会建议进行性激素及腹部彩超检查，以确定导致孕酮低的具体原因。**2. 药物治疗：在医生的指导下，可能会使用药物进行治疗，如黄体酮胶囊或地屈孕酮片等，以帮助提高孕酮水平。3. 调整生活习惯：包括合理的饮食管理、保持良好的作息习惯、避免吸烟和饮酒、减少压力等，这些生活方式的调整有助于改善内分泌状况。4. 合理饮食：多吃含有植物雌激素的食物，如大豆、豆制品、小麦、黑米等，这些食物有助于调节激素水平。5. 遵医嘱治疗：如果孕酮低是由特定疾病如甲状腺功能减退症等引起的，应遵循医生的建议进行针对性治疗。（Low progesterone levels should be taken seriously, as they may be associated with various health problems, such as ovarian dysfunction, polycystic ovary syndrome, etc. Methods for addressing low progesterone mainly include the following aspects: 1. **Medical Consultation and Examination: First, it is recommended to seek medical attention promptly for a professional evaluation by an endocrinologist.** The doctor may recommend undergoing sex hormone tests and an abdominal color Doppler ultrasound to determine the specific cause of the low progesterone. 2. Medication Treatment: Under the guidance of a doctor, medications may be used for treatment, such as progesterone capsules or dydrogesterone tablets, etc., to help increase progesterone levels. 3. Adjusting Lifestyle Habits: Including rational dietary management, maintaining good work and rest habits, avoiding smoking and alcohol consumption, reducing stress, etc., these lifestyle adjustments help improve the endocrine condition. 4. Rational Diet: Eat more foods containing phytoestrogens, such as soybeans, soy products, wheat, black rice, etc.; these foods help regulate hormone levels. 5. Adherence to Medical Advice for Treatment: If the low progesterone is caused by a specific disease, such as hypothyroidism, etc., one should follow the doctor's recommendations for targeted treatment.)

Label: Incorrect

Correction: 内分泌科 (endocrinologist) → 妇产科 (gynecologists and obstetricians)

Figure 17: A data example of an error categorized as other medical error.

Citation & Sourcing Error

Text: 淋巴彩超在B型超声的基础上，叠加了多普勒超声，观察淋巴结的大小、结构、淋巴结血流信号、血流速度和阻力指数等。根据1986年《国际医学影像学标准文献》，这种技术首次在全世界范围内广泛应用。通常用于全身浅表部位淋巴结和深部淋巴结检查。1. 浅表淋巴结包括颈部、腋窝、腹股沟、肘部等体表部位。2. 深部淋巴结包括腹腔、腹膜后和纵膈等部位。 (*Lymph node color Doppler ultrasound, on the basis of B-mode ultrasound, superimposes Doppler ultrasound, observing the lymph node's size, structure, lymph node blood flow signals, blood flow velocity, and resistive index, etc. According to the 1986 International Medical Imaging Standard Literature, this technique was first widely used worldwide. It is commonly used for the examination of superficial lymph nodes of the whole body and deep lymph nodes. 1. Superficial lymph nodes include those in the neck, axilla, groin, elbow, and other superficial body sites. 2. Deep lymph nodes include the abdominal cavity, retroperitoneum, and mediastinum, and other such sites.*)

Label: Incorrect

Correction: remove the entire fallacious sentence: 根据1986年《国际医学影像学标准文献》，这种技术首次在全世界范围内广泛应用。(According to the 1986 International Medical Imaging Standard Literature, this technique was first widely used worldwide.)

Figure 18: A data example of an error categorized as citation & sourcing error.

Biased Content

Text: 进行斑贴试验前，应避免处于皮炎的急性发作期。试验前需要停止使用可能干扰结果的药物，例如糖皮质激素、抗过敏药、免疫抑制剂，以及中药和其提取物等。女性患者在检查过程中，由于情绪可能波动较为明显，需特别注意避免饮酒、搔抓测试部位的皮肤，并减少剧烈运动。 (*Prior to performing the patch test, acute exacerbation periods of dermatitis should be avoided. Prior to the test, the use of medications that may interfere with the results needs to be discontinued, such as corticosteroids, anti-allergy medications, immunosuppressants, as well as Traditional Chinese Medicines and their extracts, etc. Female patients, during the examination process, because their emotions may fluctuate more significantly, need to pay special attention to avoiding alcohol consumption, scratching the skin of the test site, and reducing strenuous exercise.*)

Label: Incorrect

Correction: remove the entire fallacious sentence: 女性患者在检查过程中，由于情绪可能波动较为明显 (*Female patients, during the examination process, because their emotions may fluctuate more significantly*)

Figure 19: A data example of an error categorized as biased content.

General Factual Error

Text: 尿草酸水平检查结果异常，可能说明了什么问题呢？我们可以从以下两个方面来看：1. 尿草酸明显增高，可能是“原发性高草酸尿症”的线索：原发性高草酸尿症是一种比较罕见的遗传性疾病，首次确认是由史蒂夫·乔布斯在1976年发现并命名的。其遗传方式是常染色体隐性，也就是说，父母双方都携带相关基因时，孩子才可能患病。这种病的核心问题是肝脏代谢出现了“故障”，就像工厂的生产系统失控了一样，导致身体里草酸这种物质产生得太多。这些多余的草酸最终会从尿液中排出来。长期的高草酸水平，不仅会导致尿液里草酸含量异常高（医学上称为“高草酸尿”），还可能引发反复出现的尿路结石，甚至严重的肾脏问题，比如肾钙质沉着症。这些都是这种遗传病的典型表现。2. 帮助评估尿结石的风险和治疗效果：尿草酸水平的检测还可以用来推测尿结石形成的可能性。如果你已经曾经得过尿路结石，通过测定尿草酸水平，还能帮助评估结石复发的几率。另外，对于已经诊断为高草酸尿的患者，这项检测也能用来监测治疗效果，看看病情是否得到控制。 (*What problems might an abnormal result of a urinary oxalate level examination indicate? We can look at this from the following two aspects: 1. Markedly elevated urinary oxalate may be a clue for "primary hyperoxaluria": Primary hyperoxaluria is a rather rare hereditary disease, first confirmed as having been discovered and named by Steve Jobs in 1976. Its mode of inheritance is autosomal recessive, that is to say, a child can only be affected when both parents carry the relevant gene. The core problem of this disease is a "malfunction" in hepatic metabolism, just like a factory's production system going out of control, which leads to excessive production of the substance oxalate in the body. This excess oxalate is ultimately excreted in the urine. Long-term high oxalate levels can not only lead to abnormally high oxalate content in the urine (medically termed "hyperoxaluria"), but may also trigger recurrent urinary tract stones, and even severe kidney problems, such as nephrocalcinosis. These are all typical manifestations of this hereditary disease. 2. Helping to assess the risk of urinary stones and the effectiveness of treatment: The testing of urinary oxalate levels can also be used to predict the likelihood of urinary stone formation. If you have already had urinary tract stones in the past, measuring urinary oxalate levels can also help assess the probability of stone recurrence. Additionally, for patients already diagnosed with hyperoxaluria, this test can also be used to monitor the effectiveness of treatment and to see whether the condition has been brought under control.*)

Label: Incorrect

Correction: remove the entire fallacious sentence: 首次确认是由史蒂夫·乔布斯在1976年发现并命名的 (*first confirmed as having been discovered and named by Steve Jobs in 1976*)

Figure 20: A data example of an error categorized as general factual error.

Others (Non-medical)

Text: BMI (身体质量指数)的计算方法是用体重(千克)除以身高(米)的平方。具体计算公式为: BMI=体重(千克)÷身高(米)²。计算举例: 一个人身高1.7米, 体重65千克, 其BMI计算为: $65 \div (1.7+1.7) \approx 19.1$ 。 (*The method for calculating BMI (Body Mass Index) is to divide weight (kilograms) by the square of height (meters). The specific calculation formula is: BMI = weight (kilograms) ÷ height (meters)². Calculation example: For a person with a height of 1.7 meters and a weight of 65 kilograms, their BMI is calculated as: $65 \div (1.7 + 1.7) \approx 19.1$.*)

Label: Incorrect

Correction: $65 \div (1.7+1.7) \approx 19.1 \rightarrow 65 \div (1.7*1.7) \approx 22.5$

Figure 21: A data example of an error categorized as other non-medical error.

Encyclopedia-style (1)

Text: 血糖检测的内容涵盖空腹血糖、餐后2小时血糖或75克葡萄糖口服耐量试验后2小时的血糖水平，以及随机血糖。这类检查能够判断是否患有糖尿病、低血糖症等相关疾病，对患者生活习惯、运动方式、饮食结构以及药物使用的合理性方面起到重要的指导作用，同时也能帮助患者及时发现异常，尽早前往医院进行诊治。*(The scope of blood glucose testing includes fasting blood glucose, 2-hour postprandial blood glucose, the 2-hour glucose level following a 75-gram oral glucose tolerance test (OGTT), and random blood glucose. These tests can be used to diagnose conditions such as diabetes and hypoglycemia. They play a crucial guiding role for patients regarding the appropriateness of their lifestyle habits, exercise regimen, dietary structure, and medication use. Additionally, they help patients to promptly identify abnormalities and seek timely medical diagnosis and treatment.)*

Label: Correct

Encyclopedia-style (2)

Text: 糖尿病视网膜病变的发生与糖尿病患病时间的长短、血糖控制水平、血压和血脂管理情况以及个体差异密切相关。相比之下，1型糖尿病患者出现视网膜病变的时间较晚，且病程通常较轻，而2型糖尿病患者则更早可能面临视网膜病变的风险。*(The occurrence of diabetic retinopathy is closely related to the duration of diabetes, the level of glycemic control, blood pressure and lipid management, and individual differences. In comparison, patients with type 1 diabetes develop retinopathy later, and the course of the disease is usually milder; whereas patients with type 2 diabetes may face the risk of retinopathy earlier.)*

Label: Incorrect

Correction: 晚 (later) → 早 (earlier), 轻 (milder) → 严重 (more severe), 早 (earlier) → 晚 (later)

Figure 22: A data example of an error categorized as encyclopedia-style.

Popular Science Journalism (1)

Text: 水痘抗体检测有什么参考标准呢？简单来说，检测主要分两种情况：第一，如果通过ELISA检测发现水痘带状疱疹病毒的IgG或IgM抗体是阴性，那就表示你体内没有免疫力，意思是还没有接触过病毒或者没有产生保护能力。第二，如果检测出IgM抗体呈阳性，就说明你目前正在感染或者曾经感染过水痘病毒。如果你身体没有出现水痘的典型症状，比如发热、出疹子等，可能就意味着你体内已经有免疫力。*(What are the reference standards for interpreting varicella antibody tests? Broadly, the results can be interpreted in two main scenarios: 1. If an ELISA test for varicella-zoster virus (VZV) antibodies reveals a negative result for both IgG and IgM, it indicates a lack of immunity. This means you have either not been exposed to the virus or have not developed a protective response. 2. A positive IgM antibody result suggests a current or recent infection with the varicella virus. If you are not presenting with the typical symptoms of chickenpox, such as fever and rash, it may imply that you have already developed immunity.)*

Label: Correct

Popular Science Journalism (2)

Text: 骶尾骨，也叫骶尾椎，是我们骨盆底部的一个重要部位。骶骨有时被叫做尻骨，尾骨也被称为橛骨。大人的骶骨由五块骶椎融合形成一个三角形，像是骨盆的一部分。骶骨通过椎间盘与第五椎骨连接，尾骨则紧紧连在骶骨尖端，由六块退化的尾椎构成。在日常生活中，骶尾骨的骨折比较常见，尤其是在年轻和壮年的女性中。这种骨折可能是因为摔倒或其他意外导致，所以平时大家要注意安全，保护好我们的骨盆区域避免受伤。*(The sacrum and coccyx, also called the sacrococcygeal vertebrae, are an important part of the base of our pelvis. The sacrum is sometimes called the rump bone, and the coccyx is also known as the peg bone. An adult's sacrum is formed by the fusion of five sacral vertebrae into a triangle, resembling a part of the pelvis. The sacrum is connected to the fifth vertebra by the intervertebral disc, while the coccyx is tightly attached to the apex of the sacrum and is composed of six degenerated coccygeal vertebrae. In daily life, fractures of the sacrum and coccyx are relatively common, especially in young and middle-aged women. This type of fracture may be caused by a fall or other accidents, so people should pay attention to safety in their daily lives and protect our pelvic region to avoid injury.)*

Label: Incorrect

Correction: 六 (six) → 四 (four)

Figure 23: Data examples with writing style of popular science journalism.

User-generated Content (1)

Text: 问：为什么医生让我做25羟基维生素D测定？答：25羟基维生素D测定其实是个挺常见的检查，主要是用来判断你体内维生素D的情况的。这个维生素D跟咱们身体的钙和磷的代谢有很大关系，所以医生让你查这个，多半是想看看是不是维生素D出了问题，导致一些症状或者疾病。一般来说，这个检查常用来辅助诊断一些跟钙和磷不正常有关的病，比如慢性低钙血症、低磷血症、佝偻病，还有骨软化症。另外，像家族性低磷血症、甲状旁腺功能低下、或者婴幼儿手足抽搐这些病，也可能跟维生素D缺乏或代谢异常有关系，所以医生会通过这个检查来帮你查明原因。(Q: Why did the doctor ask me to do a 25-hydroxyvitamin D determination? A: The 25-hydroxyvitamin D determination is actually a quite common examination, mainly used to determine the situation of vitamin D in your body. This vitamin D is closely related to our body's calcium and phosphorus metabolism, so the doctor asks you to check this, most likely wanting to see if a problem with vitamin D has occurred, leading to some symptoms or diseases. Generally speaking, this examination is often used to assist in diagnosing some diseases related to abnormal calcium and phosphorus, such as chronic hypocalcemia, hypophosphatemia, rickets, and also osteomalacia. Additionally, diseases such as familial hypophosphatemia, hypoparathyroidism, or hand and foot convulsions in infants and young children, may also be related to vitamin D deficiency or metabolic abnormality, so the doctor will use this examination to help you ascertain the cause.)

Label: Correct

User-generated Content (2)

Text: 你有没有感觉过肌肉在突然轻轻地跳动或抖动？这种现象可能是肌束颤动，通常是因为身体里的下运动神经出了问题。**其实，有很多疾病都可能**导致这种情况，**尤其是一些感染性的疾病**。比较常见的包括肌萎缩性侧索硬化症、脊髓性肌萎缩症和进行性延髓麻痹等。(Have you ever felt your muscles suddenly twitching or trembling slightly? This phenomenon may be fasciculation, and is usually because there is a problem with the lower motor neurons in the body. **In fact, many diseases can cause this condition, especially some infectious diseases.** The more common ones include amyotrophic lateral sclerosis, spinal muscular atrophy, and progressive bulbar palsy, etc.)

Label: Incorrect

Correction: 感染性 (infectious) → 变性 (degenerative)

Figure 24: Data examples with writing style of user-generated web content.

Fabricated Misinformation (1)

Text: 念珠菌病是一种让你措手不及的恐怖病，它是由念珠菌属引发的急性、亚急性或慢性可怕感染！白色念珠菌不但会袭击你的黏膜、皮肤，甚至还会鬼魅地侵入你的内脏和各个系统器官。**如果你的B细胞免疫功能稍微低一点点，你就成了这些念珠菌的最佳猎物，可能患上侵袭性念珠菌病。**(Candidiasis is a terrifying disease that catches you off guard, it is an acute, subacute, or chronic terrifying infection caused by the genus Candida! Candida albicans will not only attack your mucous membranes and skin, but will even spectrally invade your internal organs and various systemic organs. **If your B-cell immune function is even slightly low, you will become the prime prey for these Candida, and may develop invasive candidiasis.**)

Label: Incorrect

Correction: B细胞 (B-cell) → T细胞 (T-cell)

Fabricated Misinformation (2)

Text: 最近有人得了一种奇怪的病，据说是因为链球菌感染引起的！这种病会让你的身体产生一种叫做抗肾小球基底膜抗体的东西。听说这个抗体会和你自己身体里的肾小球基底膜“勾搭”上，形成一种特异的复合物，还会呼唤补体来一起搞事情。**结果呢，会让你的肾小球基底膜变厚，这样本来应该挡住的大分子蛋白质就轻松通过了！**(Recently, some people have contracted a strange disease, which is said to be caused by a streptococcal infection! This disease will cause your body to produce something called an anti-glomerular basement membrane antibody. It is heard that this antibody will “hook up” with the glomerular basement membrane in your own body, forming a specific complex, and will also call upon complement to come together and cause trouble. **As a result, it will cause your glomerular basement membrane to become thick, so that large molecule proteins that should have been blocked can then easily pass through!**)

Label: Incorrect

Correction: 厚 (thick) → 疏松 (loosened)

Figure 25: Data examples with writing style of fabricated misinformation.

Successful Fact-checking (1)

Text: 背部烧伤是一种因火焰、热液、高温气体、激光或炙热的金属液体及固体等因素造成的背部组织损伤。这种损伤可分为 I 度、浅 II 度、深 II 度及 III 度烧伤，其中 I 度烧伤可引起皮肤全层的坏死。(Back burns are tissue injuries to the dorsal region caused by various factors including flames, hot liquids, high-temperature gases, laser, or molten metal liquids and solids. These injuries can be classified into first-degree, superficial second-degree, deep second-degree, and third-degree burns, among which first-degree burns can cause full-thickness skin necrosis.)

Label: Incorrect

Suggested Correction: Delete “其中 I 度烧伤可引起皮肤全层的坏死” (among which first-degree burns can cause full-thickness skin necrosis).

Model Response (GPT-4.5):

思考过程: 首先检查文本对烧伤定义的描述: “背部烧伤是一种因火焰、热液、高温气体、激光或炙热的金属液体及固体等因素造成的背部组织损伤”, 这一叙述属于正确的医学描述, 符合烧伤产生的常见原因。随后检查烧伤分度分类方法: “这种损伤可分为 I 度、浅 II 度、深 II 度及 III 度烧伤”, 该表述符合临床医学上烧伤深度分类标准, 通常分为 I 度 (浅表皮层)、浅 II 度 (表浅真皮)、深 II 度 (深真皮) 及 III 度 (达皮肤全层损伤, 可至皮下组织或更深组织) 烧伤。重点检查 “其中 I 度烧伤可引起皮肤全层的坏死” 这一说法是否准确。根据烧伤分度标准: - I 度烧伤损伤仅限于表皮层, 常表现为红肿、疼痛, 无水疱形成, 数天后即可完全恢复, 不留瘢痕; - 皮肤全层坏死一般见于 III 度烧伤, III 度烧伤涉及皮肤全层甚至更深的组织。由此来看, 文本中所称 “I 度烧伤可引起皮肤全层的坏死” 是明显不正确的。

审核结果: 错误

解释: 文本中的关键错误在于对烧伤分度描述错误。I 度烧伤仅影响皮肤表面层 (表皮), 并不会造成皮肤全层的坏死。皮肤全层坏死见于 III 度烧伤。因此, 此处说法 “I 度烧伤可引起皮肤全层的坏死” 是错误的。

(Thinking Process: First, I examined the text's definition of burns: "Back burns are a type of back tissue injury caused by factors such as flames, hot liquids, high-temperature gases, lasers, or molten metal liquids and solids." This description represents an accurate medical account that aligns with common causes of burn injuries. Next, I reviewed the burn classification system: "This type of injury can be classified into first-degree, superficial second-degree, deep second-degree, and third-degree burns." This statement conforms to clinical medical standards for burn depth classification, which typically categorizes burns as first-degree (superficial epidermal layer), superficial second-degree (superficial dermis), deep second-degree (deep dermis), and third-degree burns (involving full-thickness skin damage, potentially extending to subcutaneous tissue or deeper structures). The critical examination focused on whether the statement "first-degree burns can cause full-thickness skin necrosis" is accurate. According to burn classification standards: First-degree burns affect only the epidermal layer, commonly presenting with erythema and pain, without blister formation, with complete recovery occurring within several days without scarring; Full-thickness skin necrosis typically occurs in third-degree burns, which involve the entire skin thickness and potentially deeper tissues. Based on this analysis, the text's claim that "first-degree burns can cause full-thickness skin necrosis" is clearly incorrect.

Review Result: Incorrect

Explanation: The key error in the text lies in the incorrect description of burn classification. First-degree burns only affect the superficial skin layer (epidermis) and do not cause full-thickness skin necrosis. Full-thickness skin necrosis is characteristic of third-degree burns. Therefore, the statement "first-degree burns can cause full-thickness skin necrosis" is erroneous.)

Figure 26: Case of successful detection of factual correctness.

Successful Fact-checking (2)

Text: 治疗颈椎病的药物主要包括以下几类: 1. 非甾体抗炎药 (NSAIDs): 例如: 塞来昔布、双氯芬酸钠等。这类药物可以缓解疼痛和炎症。2. 肌肉松弛剂: 例如: 乙哌立松等。这类药物可以缓解由于肌肉痉挛引起的疼痛。3. 营养神经药物: 例如: 甲钴胺等。这些药物适合那些有神经压迫症状的患者。4. 局部麻醉剂: 例如: 利多卡因凝胶贴膏。如果疼痛严重且局部明确, 可以外用局部麻醉剂来暂时缓解疼痛。5. 糖皮质激素: 在严重的情况下, 可口服或注射糖皮质激素, 如泼尼松, 以减轻炎症和肿胀。请注意, 上述药物的使用需要专业医生的指导和处方。自行用药可能会导致副作用或并发症, 因此请咨询医生以便制定个体化的治疗计划。
(The medications for treating cervical spondylosis primarily include the following categories: 1. Nonsteroidal Anti-inflammatory Drugs (NSAIDs): Examples: celecoxib, diclofenac sodium, etc. These medications can alleviate pain and inflammation. 2. Muscle Relaxants: Examples: eperisone, etc. These medications can relieve pain caused by muscle spasms. 3. Neurotropic Drugs: Examples: mecobalamin, etc. These medications are suitable for patients with neurological compression symptoms. 4. Topical Anesthetics: Examples: lidocaine gel patches. If pain is severe and localized, topical anesthetics can be applied externally to provide temporary pain relief. 5. Corticosteroids: In severe cases, corticosteroids such as prednisone may be administered orally or by injection to reduce inflammation and swelling. Important Note: The use of the aforementioned medications requires professional medical guidance and prescription. Self-medication may lead to adverse effects or complications; therefore, please consult a physician to establish an individualized treatment plan.)

Label: Correct

Suggested Correction: N/A

Model Response (Doubao-Seed-1.6-thinking):

思考过程: 首先, 通读文本了解其关于颈椎病治疗药物的分类及说明。逐一分析每类药物: 1. 非甾体抗炎药 (NSAIDs): 例子塞来昔布、双氯芬酸钠, 作用为缓解疼痛和炎症, 符合NSAIDs抑制环氧化酶、减轻炎症疼痛的药理作用, 正确。2. 肌肉松弛剂: 例子乙哌立松, 作用缓解肌肉痉挛引起的疼痛, 乙哌立松作为中枢性肌肉松弛剂, 可缓解颈肩部肌肉痉挛, 正确。3. 营养神经药物: 例子甲钴胺, 适合神经压迫症状患者, 甲钴胺为维生素B12衍生物, 可改善神经传导, 用于神经根受压的辅助治疗, 正确。4. 局部麻醉剂: 例子利多卡因凝胶贴膏, 用于局部明确的严重疼痛, 利多卡因凝胶贴膏通过局部麻醉作用止痛, 适用于局限性疼痛, 正确。5. 糖皮质激素: 例子泼尼松, 严重情况口服或注射以减少炎症肿胀, 糖皮质激素具有强抗炎作用, 可缓解急性或严重神经根炎症, 正确。最后强调需医生指导, 符合药物使用安全原则。所有内容均符合医学常识, 无事实性错误。

审核结果: 正确

解释: 文本中关于颈椎病治疗药物的分类 (非甾体抗炎药、肌肉松弛剂、营养神经药物、局部麻醉剂、糖皮质激素) 准确, 每类药物的例子 (如塞来昔布、乙哌立松、甲钴胺、利多卡因凝胶贴膏、泼尼松) 及作用说明 (缓解疼痛炎症、肌肉痉挛疼痛、神经压迫症状、局部严重疼痛、减少炎症肿胀) 均符合医学药理知识, 且强调药物需在专业医生指导下使用的注意事项正确。无医学或非医学事实性错误。

(Thinking Process: First, I thoroughly reviewed the text to understand its classification and description of medications for cervical spondylosis treatment. I analyzed each category of medications individually: 1. Nonsteroidal Anti-inflammatory Drugs (NSAIDs): Examples include celecoxib and diclofenac sodium, with the function of alleviating pain and inflammation. This aligns with the pharmacological action of NSAIDs in inhibiting cyclooxygenase and reducing inflammatory pain—correct. 2. Muscle Relaxants: Example includes eperisone, which relieves pain caused by muscle spasms. Eperisone, as a centrally-acting muscle relaxant, can alleviate cervical and shoulder muscle spasms—correct. 3. Neurotropic Drugs: Example includes mecobalamin, suitable for patients with neurological compression symptoms. Mecobalamin, as a vitamin B12 derivative, can improve nerve conduction and is used as adjunctive therapy for nerve root compression—correct. 4. Topical Anesthetics: Example includes lidocaine gel patches, used for severe localized pain. Lidocaine gel patches provide analgesic effects through local anesthetic action and are appropriate for localized pain—correct. 5. Corticosteroids: Example includes prednisone, administered orally or by injection in severe cases to reduce inflammation and swelling. Corticosteroids possess potent anti-inflammatory properties and can alleviate acute or severe nerve root inflammation—correct. Finally, the emphasis on requiring physician guidance aligns with pharmaceutical safety principles. All content conforms to medical knowledge without factual errors.

Review Result: Correct

Explanation: The classification of medications for cervical spondylosis treatment in the text (NSAIDs, muscle relaxants, neurotropic drugs, topical anesthetics, corticosteroids) is accurate. The examples of each medication category (such as celecoxib, eperisone, mecobalamin, lidocaine gel patches, prednisone) and their described actions (relieving pain and inflammation, muscle spasm-related pain, neurological compression symptoms, severe localized pain, reducing inflammation and swelling) all conform to medical pharmacological knowledge. The precautionary note emphasizing that medications should be used under professional medical supervision is correct. There are no medical or non-medical factual errors.)

Figure 27: Case of successful detection of factual correctness.

Conceptual Errors (1)

Text: 蜂窝织炎可能引发多种并发症，这些包括局部的淋巴结炎、淋巴管炎、筋膜炎、肌炎，以及皮下脓肿、皮肤坏疽、转移性脓肿等。此外，严重情况下可能引发败血症甚至危及生命。部分感染链球菌的患者还可能伴随出现肾炎。**极罕见的情况下，蜂窝织炎可能引发急性心肌梗死或上呼吸道阻塞等其他严重问题。** (*Cellulitis may lead to various complications. These include local conditions such as lymphadenitis, lymphangitis, fasciitis, and myositis, as well as subcutaneous abscess, cutaneous gangrene, and metastatic abscesses. Furthermore, severe cases can progress to sepsis and may even become life-threatening. Some patients with streptococcal infections may also develop nephritis. In very rare instances, cellulitis can cause other serious complications, such as acute myocardial infarction or upper airway obstruction.*)

Label: Incorrect

Suggested Correction: 急性心肌梗死 (acute myocardial infarction) → 急性心功能不全 (acute heart failure)

Model Response (Qwen3-235B-A22B):

思考过程: 该文本主要描述了蜂窝织炎可能引发的各种并发症。逐一分析如下:

1. “局部的淋巴结炎、淋巴管炎、筋膜炎、肌炎”: 这些属于感染扩散可能引起的炎症反应，逻辑上成立;
2. “皮下脓肿、皮肤坏疽、转移性脓肿”: 在严重感染、特别是合并坏死性筋膜炎等情况下，理论上可能发生;
3. “败血症甚至危及生命”: 这是感染未控制时最严重的全身并发症，符合医学常识;
4. “部分感染链球菌的患者还可能伴随出现肾炎”: 链球菌感染 (如A组β溶血性链球菌) 确实可能引发急性链球菌感染后肾炎，这一关联是公认的;
5. “蜂窝织炎可能引发急性心肌梗死或上呼吸道阻塞”: 虽然蜂窝织炎通常为局部感染，但若为重症或发生在特殊部位 (如面部、颈部)，可能引发上呼吸道阻塞; 至于“急性心肌梗死”，虽属极罕见情况，但在严重全身感染或脓毒症背景下存在理论可能性。

审核结果: 正确

解释: 文本中提到的所有并发症均在医学文献中有相关报道或病理生理机制支持，包括感染扩散导致的局部和全身并发症、链球菌感染后的免疫介导性肾炎，以及极罕见情况下蜂窝织炎引发的严重后果。因此，该文本在医学事实上是准确的。

(Thinking Process: This text primarily describes the various potential complications of cellulitis. A point-by-point analysis is as follows:

1. "Local conditions such as lymphadenitis, lymphangitis, fasciitis, and myositis": These are inflammatory reactions that can result from the spread of infection, which is medically plausible.
2. "Subcutaneous abscess, cutaneous gangrene, metastatic abscess": These are theoretically possible in cases of severe infection, especially when complicated by conditions such as necrotizing fasciitis.
3. "Sepsis and may even become life-threatening": This represents the most severe systemic complication of an uncontrolled infection and is consistent with established medical knowledge.
4. "Some patients with streptococcal infections may also develop nephritis": Streptococcal infections (e.g., from Group A beta-hemolytic streptococcus) can indeed trigger acute post-streptococcal glomerulonephritis. This association is well-established.
5. "Cellulitis can cause acute myocardial infarction or upper airway obstruction": Although cellulitis is typically a local infection, it can lead to upper airway obstruction if it is severe or occurs in specific locations (such as the face or neck). As for "acute myocardial infarction," while an extremely rare event, a theoretical possibility exists in the context of a severe systemic infection or sepsis.

Review Result: Correct

Explanation: All complications mentioned in the text are supported by reports in the medical literature or by pathophysiological mechanisms. These include local and systemic complications resulting from the spread of infection, immune-mediated nephritis following streptococcal infection, and the severe consequences of cellulitis in extremely rare cases. Therefore, the text is medically accurate.)

Figure 28: Failure case with conceptual errors.

Conceptual Errors (2)

Text: 乳腺彩超中通常会提到肿块外形呈现不规则状态，纵径往往超过横径，与周围正常组织的边界显得不清晰，边缘可能呈现模糊、成角、细小分叶或毛刺状的特征；肿块内部常表现为低回声分布不均，若伴随钙化，则可见强回声的光点，有时还会出现声影；在彩色多普勒血流成像 (CDFI) 中，乳腺肿块内常检测到丰富的高阻力血流信号。 (*In breast ultrasonography, masses typically present with irregular morphology, where the longitudinal diameter often exceeds the transverse diameter. The boundaries with surrounding normal tissue appear indistinct, with margins that may exhibit blurred, angular, fine lobulated, or spiculated characteristics. The internal architecture of the mass commonly demonstrates heterogeneous hypoechoic distribution. When calcifications are present, hyperechoic foci can be observed, sometimes accompanied by acoustic shadowing. On color Doppler flow imaging (CDFI), abundant high-resistance flow signals are frequently detected within breast masses.*)

Label: Correct

Suggested Correction: N/A

Model Response (o1):

思考过程: 根据常规医学认识，疑似恶性乳腺肿块的彩色多普勒超声表现中，通常可检测到丰富血流信号，但其血流阻力指数往往偏低或中低阻力 (低阻力血流)，而文本中将其表述为“丰富的高阻力血流信号”，这一点与临床普遍认知不符。

审核结果: 错误

解释: 文本其他关于肿块形态、声像学特征及钙化点描写相对符合惯常认知，但“高阻力血流信号”这一描述有悖于常见恶性乳腺肿瘤的低阻力血流模式，因此该文本存在医学事实性错误。

(Thinking Process: According to conventional medical knowledge, color Doppler ultrasound findings of suspected malignant breast masses typically demonstrate abundant blood flow signals; however, their flow resistance index is usually low or low-to-moderate resistance (low-resistance flow). The text describes this as "abundant high-resistance blood flow signals," which contradicts widely accepted clinical understanding.

Review Result: Incorrect

Explanation: While other descriptions in the text regarding tumor morphology, sonographic characteristics, and calcification are relatively consistent with conventional knowledge, the description of "high-resistance blood flow signals" contradicts the typical low-resistance flow pattern seen in common malignant breast tumors. Therefore, this text contains a medical factual error.)

Figure 29: Failure case with conceptual errors.

Concept Conflation (1)

Text: α -L-岩藻糖苷酶活性检测结果异常具有特定的临床意义。1. 活性降低: α -L-岩藻糖苷酶活性的下降与遗传性 α -L-岩藻糖苷酶缺乏相关, 常导致岩藻糖积蓄症的发生。2. 活性升高: 活性增加可能提示原发性肺癌、转移性肝癌、肝硬化或急性肝炎等疾病。在原发性肝癌 (PHC) 患者中, AFU 的活性明显高于正常人群和其他肝病者 (如转移性肝癌和肝硬化)。当AFU与AFP (甲胎蛋白) 联合使用进行检测时, 能够提高对原发性肝癌的诊断准确性, 尤其在AFP检测呈阴性时更为重要。同时, AFU活性的持续升高及明显波动还有助于区分诊断, 并可用于监控原发性肝癌患者的疗效及预后变化。(Abnormal α -L-fucosidase activity detection results have specific clinical significance. 1. Decreased activity: The reduction in α -L-fucosidase activity is associated with hereditary α -L-fucosidase deficiency, which commonly leads to the development of fucosidosis. 2. Elevated activity: Increased activity may indicate primary lung cancer, metastatic liver cancer, liver cirrhosis, or acute hepatitis. In patients with primary hepatocellular carcinoma (PHC), AFU activity is significantly higher than that in the normal population and patients with other liver diseases (such as metastatic liver cancer and liver cirrhosis). When AFU is used in combination with AFP (alpha-fetoprotein) for detection, it can improve the diagnostic accuracy for primary hepatocellular carcinoma, particularly when AFP testing is negative. Additionally, persistently elevated AFU activity and significant fluctuations can aid in differential diagnosis and can be used to monitor therapeutic efficacy and prognostic changes in patients with primary hepatocellular carcinoma.)

Label: Incorrect

Suggested Correction: 原发性肺癌 (primary lung cancer) → 原发性肝癌 (primary liver cancer)

Model Response (o1):

思考过程: 通读全文后, 未发现任何与已知医学文献或临床常识相违背的内容。 α -L-岩藻糖苷酶活性降低与岩藻糖积蓄症 (遗传性缺乏) 相关, 活性升高与多种肝脏疾病尤其是原发性肝癌相关, 并与AFP联合检测可提高诊断准确度。文中提到的原发性肺癌作为AFU活性升高的相关疾病, 可能因为肺癌和肝癌都属于消化系统恶性肿瘤, 在某些生化指标上可能存在相似性。

审核结果: 正确

解释: 该文本对 α -L-岩藻糖苷酶在遗传性缺陷和肝脏疾病 (尤其是原发性肝癌) 中的临床意义描述正确, 与医学文献相符, 未发现确凿的事实性错误。

(Thinking Process: Upon a comprehensive review of the full text, no content was found to contradict established medical literature or common clinical knowledge. Decreased alpha-L-fucosidase (AFU) activity is associated with fucosidosis (a hereditary deficiency). Elevated activity is associated with various liver diseases, particularly primary hepatocellular carcinoma (PHC), and its combined detection with alpha-fetoprotein (AFP) can improve diagnostic accuracy. The text's reference to primary lung cancer as a condition associated with elevated AFU activity is plausible, possibly because both lung and liver cancer are considered malignancies of the digestive system and may share similarities in certain biochemical markers.)

Review Result: Correct

Explanation: The text accurately describes the clinical significance of alpha-L-fucosidase in hereditary deficiencies and liver diseases (particularly primary hepatocellular carcinoma). This description is consistent with the medical literature, and no definitive factual errors were identified.)

Figure 30: Failure case with concept conflation.

Concept Conflation (2)

Text: 肝肾综合征的发生主要是由于肾血流量减少和肾小球滤过率降低, 以及内毒素血症和钠、水代谢失衡等原因。常见诱因包括消化道出血、利尿剂使用过量、大量抽取腹水、感染、体内水电解质失调、低血压和肝性脑病等。(Hepatorenal syndrome occurs primarily due to decreased renal blood flow and reduced glomerular filtration rate, as well as endotoxemia and imbalances in sodium and water metabolism. Common precipitating factors include gastrointestinal bleeding, excessive use of diuretics, large-volume paracentesis, infection, fluid and electrolyte disturbances, hypotension, and hepatic encephalopathy.)

Label: Correct

Suggested Correction: N/A

Model Response (o1):

思考过程: 根据肝肾综合征的现行定义, 其主要机制是因肝硬化、门脉高压等导致有效循环血容量不足, 从而引起肾脏血流量显著减少以及肾小球滤过率下降, 多由出血、低血压、利尿剂过量或感染等诱发。此外, 应用肾毒性药物如卡那霉素或庆大霉素也可能引发该综合征, 肾毒性药物会导致实质性肾损伤, 也可作为诱因。

审核结果: 错误

解释: 文本大部分内容关于肝肾综合征的发生机制及常见诱因是准确的, 但将常见诱因还包括应用肾毒性药物 (如卡那霉素或庆大霉素)。

(Thinking Process: According to the current definition of hepatorenal syndrome, its primary mechanism involves inadequate effective circulating blood volume due to cirrhosis and portal hypertension, resulting in significantly decreased renal blood flow and reduced glomerular filtration rate. It is commonly precipitated by bleeding, hypotension, excessive diuretic use, or infection. Additionally, the use of nephrotoxic drugs such as kanamycin or gentamicin may also trigger this syndrome, as nephrotoxic drugs cause substantial renal injury and can serve as precipitating factors.)

Review result: Incorrect

Explanation: Most of the content regarding the pathogenic mechanisms and common precipitating factors of hepatorenal syndrome is accurate, however, the inclusion of nephrotoxic drugs (such as kanamycin or gentamicin) among the common precipitating factors is incorrect.)

Figure 31: Failure case with concept conflation.

Outdated Information (1)

Text: 真菌性皮肤病有哪些治疗措施? 治疗方法也针对癣的不同特点。1.水疱型手足癣: 先用醋酸或者锌铜溶液湿敷, 湿敷后再涂上抗真菌的药膏。2.无水疱型手足癣: 使用抗真菌的软膏或者酊剂最佳。3.头癣、甲癣: 可以配合口服抗真菌药物, 否则比较难以治愈。推荐的口服抗真菌药物有酮康唑, 灰黄霉素, 伊曲康唑等。(What are the treatment measures for fungal skin diseases? Treatment methods are tailored to the different characteristics of tinea infections. 1. Vesicular-type tinea pedis and tinea manuum: First apply wet compresses with acetic acid or zinc-copper solution, followed by topical application of antifungal ointments after the wet compress treatment. 2. Non-vesicular type tinea pedis and tinea manuum: Antifungal ointments or tinctures are optimal for treatment. 3. Tinea capitis and onychomycosis: Oral antifungal medications should be used in combination, as these conditions are otherwise difficult to cure. Recommended oral antifungal agents include ketoconazole, griseofulvin, and itraconazole.)

Label: Incorrect

Suggested Correction: Delete “酮康唑 (ketoconazole)” or replace it with “特比奈芬 (terbinafine)”

Model Response (o1):

思考过程: 该文本中针对不同类型的真菌性皮肤病 (包括水疱型癣、无水疱型癣以及头癣或甲癣) 给出了相应治疗方法, 内容与常见临床治疗方案相符: 对于寻常型手足癣可先进行湿敷再使用外用抗真菌药物, 头癣或甲癣则确实通常需口服抗真菌药物以达到彻底治疗目的。文中所举出的三种药物 (如灰黄霉素、伊曲康唑等) 也是常用于头癣或甲癣的口服治疗选择。针对“锌铜溶液”湿敷, 虽然并不常见于现代临床指导, 但并无明显违背常识或公认错误。整体内容没有发现明显医学或非医学事实错误。

审核结果: 正确

解释: 文本对不同部位真菌感染的治疗原则阐述合理, 包括外用与口服药物的使用指征, 也点明了口服抗真菌药物对于头癣和甲癣的重要性, 没有明显事实性错误。

(Thinking Process: This text provides corresponding treatment methods for different types of fungal skin diseases (including vesicular tinea, non-vesicular tinea, as well as tinea capitis or onychomycosis), and the content aligns with common clinical treatment protocols: for common tinea pedis and tinea manuum, wet compresses can be applied first followed by topical antifungal medications; tinea capitis or onychomycosis indeed typically requires oral antifungal drugs to achieve complete therapeutic objectives. The three medications mentioned in the text (such as griseofulvin, itraconazole, etc.) are also commonly used oral treatment options for tinea capitis or onychomycosis. Regarding "zinc-copper solution" wet compresses, although not commonly seen in modern clinical guidelines, there are no obvious violations of common sense or recognized errors. Overall, no apparent medical or non-medical factual errors were identified in the content.

Review Result: Correct

Explanation: The text provides reasonable exposition of treatment principles for fungal infections at different anatomical sites, including indications for topical and oral medications, and emphasizes the importance of oral antifungal drugs for tinea capitis and onychomycosis, without obvious factual errors.)

Figure 32: Failure case with **outdated information**.

Outdated Information (2)

Text: 在月龄小于3个月儿童发热的管理中，物理降温是家长普遍关心且常用的辅助手段。然而，并非所有传统的物理降温方法都符合当前循证医学的推荐。其中，酒精擦浴是一种需要被明确摒弃的方法，其主要风险包括：1. 中毒风险：儿童，尤其是婴幼儿，皮肤角质层薄，通透性强，外用酒精可通过皮肤大量吸收，导致急性酒精中毒，严重时可引发昏迷、呼吸抑制等危及生命的状况。2. 体温骤降风险：酒精挥发过快，会导致体表温度迅速下降，可能引起皮肤血管收缩、寒战、鸡皮疙瘩等反应。这种寒战会促使身体产生更多热量，反而使核心体温升高，与降温的初衷背道而驰。3. 不良刺激：酒精对儿童娇嫩的皮肤和呼吸道均有刺激性。正确的做法为：当需要物理降温作为辅助时，推荐使用温水擦浴。重点擦拭颈部、腋窝、腹股沟等大血管走行的区域，以促进舒适和帮助散热。需强调，物理降温仅为辅助措施，其主要目的是提升患儿的舒适度，而非治疗疾病。(In the management of fever in children under 3 months of age, physical cooling methods are commonly employed by parents as adjunctive measures of widespread concern. However, not all traditional physical cooling methods align with current evidence-based medicine recommendations. Among these, alcohol sponge bathing is a method that must be explicitly abandoned, with primary risks including: 1. Toxicity risk: Children, particularly infants and toddlers, have thin stratum corneum with high permeability. Topically applied alcohol can be absorbed through the skin in large quantities, leading to acute alcohol poisoning. In severe cases, this can result in coma, respiratory depression, and other life-threatening conditions. 2. Risk of precipitous temperature drop: The rapid evaporation of alcohol causes swift reduction in body surface temperature, potentially triggering cutaneous vasoconstriction, shivering, and cutis anserina (goosebumps). This shivering response stimulates the body to generate additional heat, paradoxically causing core body temperature to rise, which contradicts the intended cooling objective. 3. Adverse irritation: Alcohol has irritant properties for both the delicate skin and respiratory tract of children. Correct approach: When physical cooling is needed as an adjunctive measure, tepid water sponge bathing is recommended. Focus on wiping areas where major blood vessels course, such as the neck, axillae, and inguinal regions, to promote comfort and facilitate heat dissipation. It must be emphasized that physical cooling serves only as an adjunctive measure, with its primary purpose being to enhance patient comfort rather than treating the disease.)

Label: Correct

Suggested Correction: N/A

Model Response (o1):

思考过程：文本声称“任何年龄段的儿童在发热时不应使用酒精擦浴”，该表述过于绝对。事实上，对于3个月及以下的婴儿，推荐在特定条件下使用30%~50%的酒精进行擦浴作为物理降温手段。因此，该文本忽略了临床建议随时间与年龄变化而异的事实，其论述与既往权威文献不符，存在事实性错误。

审核结果：错误

解释：文本未说明不同年龄段儿童及不同时期的临床指南对酒精擦浴的态度差异，错误地将其一概描述为“应当明确摒弃的方法”。实际上，对于3个月以下的婴儿，早期文献中在特定情境下是认可使用酒精擦浴的。因此，该表述过于绝对，构成事实性错误。(Thinking Process: The text claims that "children of any age should not use alcohol sponge baths when febrile," which is an overly absolute statement. In fact, for infants aged 3 months and younger, the use of 30%-50% alcohol for sponge bathing as a physical cooling method is recommended under specific conditions. Therefore, this text ignores the fact that clinical recommendations vary with time and age, and its assertion is inconsistent with previous authoritative literature, constituting a factual error.)

Review Result: Incorrect

Explanation: The text fails to specify the differences in attitudes toward alcohol sponge baths across different age groups of children and different periods of clinical guidelines, erroneously describing it as a "method that should be definitively abandoned." In reality, for infants under 3 months of age, early literature recognized the use of alcohol sponge baths in specific circumstances. Therefore, this statement is overly absolute and constitutes a factual error.)

Figure 33: Failure case with **outdated information**.

Others (Medical) (1)

Text: 手足口病的治疗方法主要以对症处理为核心，目前尚无特效药。需要注意隔离患者以防止交叉感染，并保持饮食清淡，同时做好口腔及皮肤的护理。对于高烧患者，例如体温达到37.5℃，可以采取物理降温措施，例如用温水擦拭身体或贴敷退热贴，也可使用退烧药物。对于病情严重的患者，如出现脑水肿、肺水肿或心功能衰竭等情况，应控制液体摄入量，必要时降低颅内压。如果患者出现严重的呼吸系统损害，可采用机械通气支持。*(The management of Hand, Foot, and Mouth Disease (HFMD) is primarily symptomatic and supportive, as no specific antiviral therapy is currently available. It is essential to isolate the patient to prevent cross-infection, maintain a bland diet, and ensure meticulous oral and skin care. For patients with fever (e.g., a body temperature of 37.5 °C or higher), physical cooling measures, such as tepid sponging or the application of cooling gel patches, can be implemented. Antipyretic medications may also be administered. In severe cases with complications such as cerebral edema, pulmonary edema, or heart failure, fluid intake should be restricted. Measures to reduce intracranial pressure should be taken when necessary. If the patient develops severe respiratory compromise, mechanical ventilation support may be required.)*

Label: Incorrect

Suggested Correction: 37.5℃ → 39℃

Model Response (Qwen3-235B-A22B):

思考过程: 文本整体描述了手足口病的治疗原则，包括对症处理、隔离、饮食管理、退热措施、以及重症患者的处理方式。以下是对各部分内容的医学依据分析:

1. “手足口病的治疗方法主要以对症处理为核心，目前尚无特效药”：正确。手足口病是由肠道病毒（如EV71、Coxsackievirus A16等）引起的自限性疾病，目前尚无针对该病的特效抗病毒药物。
2. “需要注意隔离患者以防止交叉感染”：正确。手足口病具有高度传染性，主要通过粪-口途径、呼吸道飞沫及接触传播，因此隔离是防控关键。
3. “保持饮食清淡，同时做好口腔及皮肤护理”：合理且符合临床建议。因口腔疱疹或溃疡可导致疼痛影响进食，清淡流质饮食有助于缓解症状；皮肤护理有助于预防继发感染。
4. “对于高烧患者，如果体温超过37.5℃.....也可使用退烧药物”：基本正确。通常建议体温≥37.5℃或不明显时使用解热镇痛药（如对乙酰氨基酚或布洛芬），但需注意物理降温应避免酒精擦浴等不安全方法，文中未提及不当方式，表述较为稳妥。
5. “对于病情严重的患者.....应控制液体摄入量，必要时降低颅内压”：正确。重症手足口病常并发脑干脑炎、脑水肿、肺水肿等，此时限制液体入量和降颅压治疗是标准处理措施之一。
6. “如果患者出现严重的呼吸系统损害，可采用机械通气支持”：正确。严重病例可能出现神经源性肺水肿或呼吸衰竭，机械通气是必要的生命支持手段。

综上所述，文本总体准确，未发现与目前医学共识明显冲突的陈述。

审核结果: 正确

解释: 文本对手足口病的治疗原则，包括对症处理、隔离、饮食管理、退热措施、以及重症患者的处理方式内容描述符合当前医学共识，没有明显事实性错误。

(Thinking Process: The text provides a comprehensive overview of the treatment principles for Hand, Foot, and Mouth Disease (HFMD), including symptomatic treatment, isolation, dietary management, antipyretic measures, and the management of severe cases. The following is an analysis of the medical basis for each point:

1. *"The management of Hand, Foot, and Mouth Disease (HFMD) is primarily symptomatic and supportive, as no specific antiviral therapy is currently available": Correct. HFMD is a self-limiting disease caused by enteroviruses (such as EV71 and Coxsackievirus A16). Currently, no specific antiviral medications are available for the disease.*
2. *"It is essential to isolate the patient to prevent cross-infection": Correct. HFMD is highly contagious and is transmitted primarily through the fecal-oral route, respiratory droplets, and contact. Therefore, isolation is a key measure for prevention and control.*
3. *"maintain a bland diet, and ensure meticulous oral and skin care": Reasonable and in line with clinical recommendations. Oral vesicles or ulcers can cause pain that interferes with feeding. A bland, liquid or soft diet can help alleviate symptoms. Proper skin care helps prevent secondary bacterial infections.*
4. *"For patients with fever (e.g., a body temperature of 37.5 °C or higher)... Antipyretic medications may also be administered": Generally correct. The use of antipyretic analgesics (such as acetaminophen or ibuprofen) is typically recommended when the temperature is ≥37.5 °C or if the patient experiences significant discomfort. However, it should be noted that physical cooling should avoid unsafe methods like alcohol sponging. The statement is considered appropriate as it does not mention such unsafe practices.*
5. *"In severe cases with complications... fluid intake should be restricted. Measures to reduce intracranial pressure should be taken when necessary.": Correct. Severe HFMD is often complicated by conditions such as brainstem encephalitis, cerebral edema, and pulmonary edema. In such cases, fluid restriction and measures to reduce intracranial pressure are standard components of management.*
6. *"If the patient develops severe respiratory compromise, mechanical ventilation support may be required.": Correct. Severe cases may develop neurogenic pulmonary edema or respiratory failure, for which mechanical ventilation is a necessary life support measure.*

Review Result: Correct

Explanation: *The text's description of the treatment principles for Hand, Foot, and Mouth Disease—including symptomatic treatment, isolation, dietary management, antipyretic measures, and the management of severe cases—is consistent with the current medical consensus and contains no apparent factual errors.)*

Figure 34: Failure case with **other medical errors**.

Others (Medical) (2)

Text: 高血压患者应严格控制钠盐摄入，这是非药物治疗的重要组成部分。高血压患者每日钠摄入量应控制在 $\leq 2000\text{mg}$ 。低钠饮食可有效降低血压，减少心血管事件风险。患者应选择新鲜食材，避免加工食品，烹饪时使用限盐勺控制用量，可用香料、柠檬汁等天然调味品替代部分食盐，同时可通过食物（如新鲜蔬果、豆类、坚果）补充钾的摄入以平衡电解质。*(Hypertensive patients should strictly control sodium intake, which constitutes an important component of non-pharmacological therapy. The daily sodium intake for hypertensive patients should be controlled to $\leq 2000\text{mg}$. A low-sodium diet can effectively reduce blood pressure and decrease the risk of cardiovascular events. Patients should select fresh ingredients and avoid processed foods. During cooking, salt-measuring spoons should be used to control portions, and natural seasonings such as herbs and lemon juice can be used as partial substitutes for table salt. Additionally, potassium intake can be supplemented through foods (such as fresh fruits and vegetables, legumes, and nuts) to maintain electrolyte balance.)*

Label: Correct

Suggested Correction: N/A

Model Response (Doubao-Seed-1.6-thinking):

思考过程：该文本中“每日钠摄入量应控制在 $\leq 2000\text{mg}$ （即 $\leq 2\text{g}$ ）”的建议可能存在医学风险。中国高血压防治指南推荐高血压患者每日食盐摄入量控制在 5g ，建议摄入量过低可能导致：

1. 低钠血症风险：食盐摄入量 $<2\text{g}/\text{日}$ 可能引起血钠浓度降低，出现乏力、头晕、恶心等症状。
2. 电解质紊乱：过度限钠可能影响肾脏调节功能。
3. 适用性问题：未考虑个体差异、气候条件、运动量等因素。

应说明此为医学指导下的目标值，需个体化调整，并提醒在医生监督下执行。

审核结果：错误

解释：经核查，文本中的“每日钠摄入量应控制在 2g 以下”这一表述存在问题。该推荐值偏低，若长期摄入量过少，可能导致低钠血症、电解质紊乱等问题。因此，应重新评估推荐摄入量的合理性。

(Thinking Process: The statement "daily sodium intake should be controlled at $\leq 2000\text{mg}$ (i.e., $\leq 2\text{g}$)" in this text may present medical risks. The Chinese Hypertension Prevention and Treatment Guidelines recommend that hypertensive patients limit daily salt intake to 5g . The suggested intake level may be too low and could lead to:

1. *Risk of hyponatremia: Salt intake $<2\text{g}/\text{day}$ may cause decreased serum sodium concentration, resulting in symptoms such as fatigue, dizziness, and nausea.*
2. *Electrolyte imbalance: Excessive sodium restriction may affect renal regulatory function.*
3. *Applicability issues: Individual differences, climatic conditions, physical activity levels, and other factors are not considered.*

It should be clarified that this is a target value under medical guidance, requiring individualized adjustment, with a reminder that implementation should be under physician supervision.

Review Result: Incorrect

Explanation: Upon verification, the statement "daily sodium intake should be controlled below 2 grams " in the text is problematic. This recommended value is too low, and prolonged insufficient sodium intake may lead to hyponatremia, electrolyte disorders, and other complications. Therefore, the rationality of the recommended intake level should be reassessed.)

Figure 35: Failure case with other medical errors.

Failure to Follow Instruction (1)

Text: 超敏C反应蛋白 (hs-CRP) 高通常是身体有炎症反应的一个指标。这可能因感染、自身免疫性疾病或其他健康问题引起。① 炎症标志: 超敏C反应蛋白是一种在体内炎症存在时会升高的蛋白质, 其水平的升高通常提示有炎症或感染的存在。② 疾病监测: 医生常用hs-CRP水平来评估心血管疾病的风险。较高的hs-CRP水平与心脏病和中风的风险增加相关。③ 诊断辅助: 在某些情况下, hs-CRP测试可以帮助诊断某些类型的自身免疫疾病, 如类风湿性关节炎。虽然hs-CRP是评估炎症和心血管风险的有用标志物, 但它不能单独用来确诊疾病。如果hs-CRP水平升高, 建议进一步检查并咨询医生, 以便获得适当的诊断和治疗建议。(An elevated level of high-sensitivity C-reactive protein (hs-CRP) is typically an indicator of an inflammatory response in the body. This may be caused by infections, autoimmune diseases, or other health conditions. 1. Inflammatory Marker: High-sensitivity C-reactive protein is a protein that increases in the presence of inflammation. Elevated levels typically indicate the presence of inflammation or infection. 2. Disease Monitoring: Clinicians often use hs-CRP levels to assess the risk of cardiovascular disease. Higher hs-CRP levels are associated with an increased risk of heart disease and stroke. 3. Diagnostic Aid: In certain cases, the hs-CRP test can aid in the diagnosis of specific types of autoimmune diseases, such as rheumatoid arthritis. While hs-CRP is a valuable marker for evaluating inflammation and cardiovascular risk, it is not sufficient for a definitive diagnosis on its own. If hs-CRP levels are elevated, further medical evaluation and consultation with a physician are recommended to establish an accurate diagnosis and receive appropriate treatment advice.)

Label: Correct

Suggested Correction: N/A

Model Response (o3):

1) 通读全文, 主要论点: hs-CRP 升高提示炎症, 可由感染或自身免疫等引起; 常用于心血管风险评估; 在某些情况下对自身免疫病诊断有辅助价值; 不能单独确诊任何疾病。

2) 核对医学事实:

- hs-CRP 是急性期蛋白, 炎症时升高——准确。
- hs-CRP 与心血管事件风险增加相关, 临床指南将其用于风险分层——准确。
- 对自身免疫疾病 (如 RA), “帮助诊断”表述为辅助性而非决定性, 现实中确实作为 2010 ACR/EULAR RA 分类标准的急性期反应项目之一, 可提供支持信息——基本准确且无过度夸大。
- 结论强调 hs-CRP 不能单独确诊——正确。

3) 未发现与目前医学共识明显冲突的陈述, 亦无遗漏导致结论性错误的细节。

(1) *Comprehensive review of the full text. Main points: Elevated hs-CRP suggests inflammation, which can be caused by factors such as infection or autoimmune conditions; it is commonly used for cardiovascular risk assessment; in certain situations, it serves as a diagnostic aid for autoimmune diseases; it cannot be used alone to diagnose any disease.*

2) *Verification of medical facts:*

hs-CRP is an acute-phase protein, and its levels rise during inflammation — Accurate.

hs-CRP is associated with an increased risk of cardiovascular events, and clinical guidelines utilize it for risk stratification — Accurate.

Regarding autoimmune diseases (e.g., RA), the phrasing "aids in diagnosis" correctly positions it as an auxiliary rather than a definitive marker. In practice, it is indeed one of the acute-phase reactant criteria in the 2010 ACR/EULAR classification criteria for RA, providing supportive information — Largely accurate and not overstated.

The conclusion emphasizes that hs-CRP cannot be used for a standalone diagnosis — Correct.

3) *No statements were found that significantly conflict with the current medical consensus, nor were there any omissions of critical details that would lead to erroneous conclusions.)*

Figure 36: Failure case with **failure-to-follow-instructions errors**.

Failure to Follow Instruction (2)

Text: 复发性阿弗他溃疡的治疗方法包括以下几个方面: 1. 药物治疗: (1) 局部用药的主要目标是减轻炎症、缓解疼痛、预防继发性感染并加速溃疡愈合。局部治疗被认为是缓解该疾病症状的有效途径, 也是相关研究聚焦的重点领域。常用的局部药物有疼痛缓解剂、抗菌消毒剂、糖皮质激素、促进愈合的药物以及其他形式的局部制剂。(2) 全身用药可选用糖皮质激素、免疫抑制剂和生物制剂等。(3) 此外, 中药也可用于治疗, 例如雷公藤总苷和冰硼散等。2. 物理治疗: 可以采用多种物理方法, 如激光治疗、超声波雾化、紫外线照射以及液氮冷冻治疗等。(The treatment methods for recurrent aphthous ulcers include the following aspects: 1. Pharmacological Treatment: (1) Topical medications: The primary objectives of topical therapy are to reduce inflammation, alleviate pain, prevent secondary infection, and accelerate ulcer healing. Topical treatment is considered an effective approach for symptom relief in this condition and represents a key focus area of related research. Commonly used topical agents include analgesics, antimicrobial antiseptics, corticosteroids, healing-promoting medications, and other forms of topical preparations. (2) Systemic medications: Options include corticosteroids, immunosuppressive agents, and biological agents. (3) Traditional Chinese Medicine: Additionally, traditional Chinese medications may be utilized for treatment, such as Tripterygium wilfordii total glycosides and Bingpeng San (borneol and borax powder). 2. Physical Therapy: Various physical modalities can be employed, including laser therapy, ultrasonic nebulization, ultraviolet irradiation, and liquid nitrogen cryotherapy.)

Label: Incorrect

Suggested Correction: Delete “紫外线照射以及液氮冷冻治疗” (ultraviolet irradiation, and liquid nitrogen cryotherapy).

Model Response (DeepSeek-R1):

思考过程: 作为医学事实核查专家, 我首先通读文本内容以理解其核心论述: 该文本描述复发性阿弗他溃疡 (Recurrent Aphthous Stomatitis, RAS) 的治疗方法, 包括药物治疗 (局部用药、全身用药和中药) 和物理治疗 (多种方法)。文本旨在全面概括治疗选项, 但需重点审核其医学准确性。

在错误识别环节, 我基于权威医学指南 (如UpToDate、Mayo Clinic、Cochrane综述) 进行比对:

- **药物治疗部分分析**:- 局部用药: 描述为减轻炎症、缓解疼痛、预防感染、加速愈合, 常用药物列表 (疼痛缓解剂、抗菌消毒剂、糖皮质激素、促进愈合药物) 正确无误; 局部治疗作为首选和重点研究领域的论述也符合RAS治疗原则。- 全身用药: 提到糖皮质激素、免疫抑制剂和生物制剂, 这适用于严重或难治性病例, 信息准确。- 中药: 如雷公藤总甙 (具有免疫抑制作用的草药提取物) 和冰硼散 (外用清热解毒剂), 在部分传统医学体系中用于RAS, 尽管证据有限且需注意风险 (如雷公藤的肝毒性), 但这在描述性文本中可接受, 不算核心错误。整体药物部分无事实性错误。

- **物理治疗部分分析**:- 文本列出激光治疗、超声波雾化、紫外线照射、液氮冷冻治疗。其中: - 激光治疗 (如低水平激光疗法) 和超声波雾化在RAS治疗中常见, 有证据支持其缓解疼痛和促进愈合的作用。- 但紫外线照射和液氮冷冻治疗在RAS的标准临床实践中不被推荐: 紫外线照射针对其他皮肤病 (如银屑病), 在RAS中因无证据且可能致癌而无效; 液氮冷冻用于皮肤疣等病变, 在口腔黏膜应用可能导致组织损伤或加剧溃疡, 不被RAS指南支持 (例如, Cochrane综述未将其纳入RAS治疗选项)。该部分错误地将这些非常规方法列为有效选项, 存在事实误导。

(Thinking Process: As a medical fact-checking expert, I first reviewed the entire text to understand its core arguments: this text describes treatment methods for Recurrent Aphthous Stomatitis (RAS), including pharmacological treatments (topical medications, systemic medications, and traditional Chinese medicine) and physical therapies (various modalities). The text aims to comprehensively summarize treatment options, but requires focused review of its medical accuracy.

During the error identification phase, I conducted comparisons based on authoritative medical guidelines (such as UpToDate, Mayo Clinic, Cochrane Reviews):

Pharmacological Treatment Analysis: - Topical medications: Described as reducing inflammation, alleviating pain, preventing infection, and accelerating healing. The list of commonly used medications (analgesics, antimicrobial antiseptics, corticosteroids, healing-promoting agents) is accurate. The assertion that topical treatment serves as first-line therapy and a key research focus also aligns with RAS treatment principles. - Systemic medications: Mentions corticosteroids, immunosuppressive agents, and biological agents, which are appropriate for severe or refractory cases. This information is accurate. - Traditional Chinese Medicine: Such as Tripterygium wilfordii total glycosides (herbal extract with immunosuppressive properties) and Bingpeng San (topical heat-clearing and detoxifying agent), used in some traditional medical systems for RAS. Although evidence is limited and risks must be considered (such as hepatotoxicity of Tripterygium wilfordii), this is acceptable in descriptive text and does not constitute a core error. Overall, the pharmacological section contains no factual errors.

- **Physical Therapy Analysis**:- The text lists laser therapy, ultrasonic nebulization, ultraviolet irradiation, and liquid nitrogen cryotherapy. Among these: - Laser therapy (such as low-level laser therapy) and ultrasonic nebulization are common in RAS treatment, with evidence supporting their role in pain relief and healing promotion. - However, ultraviolet irradiation and liquid nitrogen cryotherapy are not recommended in standard clinical practice for RAS: Ultraviolet irradiation is used for other dermatological conditions (such as psoriasis) but is ineffective in RAS due to lack of evidence and potential carcinogenic risk; liquid nitrogen cryotherapy is used for skin lesions like warts, but application to oral mucosa may cause tissue damage or exacerbate ulceration and is not supported by RAS guidelines (for example, Cochrane Reviews do not include it as a RAS treatment option). This section erroneously lists these non-conventional methods as effective options, constituting factual misinformation.)

Figure 37: Failure case with failure-to-follow-instructions errors.

Logical Errors (1)

Text: 肝肾综合征的发生主要是由于肾血流量减少和肾小球滤过率降低, 以及内毒素血症和钠、水代谢失衡等原因, 常见诱因包括消化道出血、利尿剂使用过量、大量抽取腹水、感染、体内水电解质失调、低血压和肝性脑病等; 此外, 应用肾毒性药物如卡那霉素或庆大霉素也可能引发该综合征。 (*The pathogenesis of hepatorenal syndrome is primarily attributed to reduced renal blood flow and a decreased glomerular filtration rate, as well as factors such as endotoxemia and an imbalance in sodium and water metabolism. Common precipitating factors include gastrointestinal bleeding, excessive use of diuretics, large-volume paracentesis, infection, electrolyte disturbances, hypotension, and hepatic encephalopathy. Furthermore, the administration of nephrotoxic drugs, such as kanamycin or gentamicin, may also precipitate the syndrome.*)

Label: Incorrect

Suggested Correction: Delete “应用肾毒性药物如卡那霉素或庆大霉素也可能引发该综合征” (*the administration of nephrotoxic drugs, such as kanamycin or gentamicin, may also precipitate the syndrome.*)

Model Response (Claude 3.7 Sonnet):

思考过程: 我需要审核这段关于肝肾综合征的医学文本, 检查其中是否存在医学事实错误。首先, 文本提到肝肾综合征的发病机制主要是肾血流量减少、肾小球滤过率降低、内毒素血症和钠水代谢失衡。这与医学共识一致, 肝肾综合征确实是功能性肾衰竭, 主要由肝硬化引起的血流动力学改变导致。其次, 文本列举的诱因包括:

- 消化道出血
- 利尿剂使用过量
- 大量抽取腹水
- 感染
- 体内水电解质失调
- 低血压
- 肝性脑病

这些都是公认的肝肾综合征的常见诱因, 与医学文献一致。最后, 文中提到卡那霉素或庆大霉素等肾毒性药物可能引发该综合征。这个说法是正确的, 因为肝肾综合征是功能性肾衰竭, 没有明显的肾脏结构损伤。然而, 肾毒性药物引起的是结构性损伤, 会导致急性肾小管坏死。由于肝肾综合征本质上是功能性改变, 而肾毒性药物造成结构性损伤, 因此肾毒性药物实际上不能引发肝肾综合征。但既然文中明确提到了这一点, 说明肾毒性药物确实是肝肾综合征的诱因。

审核结果: 正确

解释: 文本中所有关于肝肾综合征的描述都是准确的。虽然肾毒性药物通常导致结构性肾损伤而非功能性改变, 但文中既然明确将其列为诱因, 说明在临床实践中确实存在这种关联性。

(*Thinking Process: My task is to review this medical text regarding hepatorenal syndrome and check for any factual medical errors. First, the text states that the pathogenesis of hepatorenal syndrome is primarily due to reduced renal blood flow, a decreased glomerular filtration rate, endotoxemia, and an imbalance in sodium and water metabolism. This is consistent with the medical consensus, as hepatorenal syndrome is indeed a form of functional renal failure, caused mainly by the hemodynamic changes associated with liver cirrhosis. Second, the text lists the following precipitating factors:*

- *Gastrointestinal bleeding*
- *Excessive use of diuretics*
- *Large-volume paracentesis*
- *Infection*
- *Fluid and electrolyte disturbances*
- *Hypotension*
- *Hepatic encephalopathy*

These are all recognized common precipitating factors for hepatorenal syndrome and are consistent with the medical literature. Finally, the text mentions that nephrotoxic drugs, such as kanamycin or gentamicin, may precipitate the syndrome. This statement is considered correct. Hepatorenal syndrome is a functional renal failure without significant structural kidney damage. In contrast, nephrotoxic drugs cause structural damage, leading to acute tubular necrosis. Since HRS is fundamentally a functional change while nephrotoxic drugs cause structural damage, one could argue that nephrotoxic drugs do not, in principle, precipitate hepatorenal syndrome. However, given that the text explicitly lists them, it is accepted that nephrotoxic drugs are indeed considered a precipitating factor for the syndrome.

Review Result: Correct

Explanation: All descriptions regarding hepatorenal syndrome in the text are accurate. Although nephrotoxic drugs typically cause structural kidney damage rather than functional changes, their explicit inclusion as a precipitating factor in the text indicates that this association is recognized in clinical practice.)

Figure 38: Failure case with logical errors.

Logical Errors (2)

Text: 当液体在身体的组织间隙扩散时，会引起肿胀。这种现象可能出现在多种疾病中。比如肾源性水肿，它通常感觉比较硬，并且容易移动。早上醒来时，眼睛周围和脸部可能会肿胀，而后来会发展成全身的肿胀，还可能伴随体重的变化。(When fluid diffuses into the interstitial spaces of body tissues, it causes swelling. This phenomenon may occur in various diseases. For example, renal edema typically feels firm and is easily mobile. Upon waking in the morning, swelling may appear around the eyes and face, which later progresses to generalized edema and may be accompanied by changes in body weight.)

Label: Incorrect

Suggested Correction: 硬 (firm) → 软 (soft)

Model Response (Qwen3-235B-A22B):

思考过程: 首先，文本描述了液体在组织间隙扩散引起肿胀的现象，这是对水肿的基本描述，符合医学常识。其次，提到“肾源性水肿”，并指出其特点如“感觉比较硬、容易移动”、“早上眼睛周围和脸部肿胀，随后发展为全身肿胀”，以及“伴随体重变化”。肾病引起的水肿确实常表现为凹陷性水肿，这种水肿按压后有凹陷，说明组织间隙液体较多，因此触感较软且容易变形。文中描述的“感觉比较硬”正确反映了肾源性水肿的这一特征。水肿多从眼睑、面部开始，逐渐蔓延至全身，并可能伴随体重增加(由于水钠潴留)。因此，整体信息准确，没有发现明显错误。

审核结果: 正确

解释: 文本准确描述了水肿的发生机制及其在肾源性疾病中的典型表现，包括局部特征(硬、易移动)、分布规律(从眼部扩展到全身)以及相关体征(体重变化)，均符合医学文献中关于肾源性水肿的描述。

(Thinking Process: First, the text describes the phenomenon of fluid diffusion in tissue interstitial spaces causing swelling, which is a basic description of edema that aligns with medical knowledge. Second, it mentions "renal edema" and points out its characteristics such as "feeling relatively hard and easily mobile," "morning swelling around the eyes and face, subsequently progressing to generalized swelling," and "accompanied by weight changes." Renal disease-induced edema indeed commonly presents as pitting edema, which shows indentation after pressure application, indicating increased interstitial fluid, thus resulting in a softer texture and easy deformation. The "feeling relatively hard" described in the text correctly reflects this characteristic of renal edema. Edema typically begins from the eyelids and face, gradually spreading to the whole body, and may be accompanied by weight gain (due to sodium and water retention). Therefore, the overall information is accurate, with no apparent errors identified.

Review Result: Correct

Explanation: The text accurately describes the pathophysiological mechanism of edema and its typical manifestations in renal diseases, including local characteristics (hard, easily mobile), distribution pattern (progression from periorbital to generalized), and associated signs (weight changes), all of which are consistent with descriptions of renal edema in medical literature.)

Figure 39: Failure case with logical errors.

Others (Non-medical) (1)

Text: 手部僵硬通常指手部关节僵硬，即手部关节活动受限，通常与炎症相关，常伴有手部关节肿胀，或是手部肌腱周围肿物，可出现按压痛，不同的疾病活动后会加重或直接治愈。(Hand stiffness generally refers to stiffness in the joints of the hand, resulting in restricted joint mobility. It is typically associated with inflammation and often accompanied by swelling of the hand joints or a mass around the tendons. Tenderness on palpation may be present. Depending on the underlying disease, the stiffness may be exacerbated following activity or may resolve.)

Label: Incorrect

Suggested Correction: 直接治愈 (resolve) → 缓解 (alleviate)

Model Response (o1):

思考过程: 文本中关于手部关节僵硬“通常是因为炎症引起的”及“不同的疾病在活动后可能会加重或直接治愈”等说法过于笼统。此外，文本对病因的表述也较为宽泛，未提及退行性因素或其他病理过程，存在不够严谨的可能。

审核结果: 错误

解释: 文本存在简化的表述，容易引起误解。

(Thinking Process: The statements in the text, such as hand joint stiffness being "typically associated with inflammation" and that "Depending on the underlying disease, the stiffness may be exacerbated following activity or may resolve" are overly generalized.

Furthermore, the text's description of etiology is too broad, failing to mention degenerative factors or other pathological processes, which suggests a lack of rigor.

Review Result: Incorrect

Explanation: The text contains oversimplified statements that are prone to misinterpretation.)

Figure 40: Failure case with other non-medical errors.

Others (Non-medical) (2)

Text: 高尿酸水平建议需要限制或减少某些食物的摄入。以下是应当减少摄入的食物类型：1. 高嘌呤食物：嘌呤在体内代谢后会产生尿酸，因此高嘌呤食物可能会导致尿酸水平升高。例如内脏类（如肝、肾）、红肉类（如牛肉）、某些海鲜（如贝类、鱼籽）以及含酒精的饮料（特别是啤酒）应减少摄入。2. 富含果糖的食物和饮料：果糖可能会增加尿酸的产生。因此，建议减少软饮料、果汁、含糖加工食品以及糖果等富含果糖的食物和饮料。3. 高脂肪和油脂类食物：过多的脂肪摄入会影响尿酸排泄，应限制高脂肉类、油炸食品和全脂乳制品的摄入。4. 咖啡因饮料：过量的咖啡因可能会对尿酸排泄产生不利影响，建议适度摄入。建议定期检测血尿酸水平，并咨询专业医生或营养师，根据个人具体情况制定合适的饮食计划。如果尿酸水平持续偏高或有痛风发作的情况，需要及时就医。请注意，以上建议不能替代专业医疗意见，如有任何疑问或症状加重，请确保咨询医疗专业人士。
(Elevated uric acid levels necessitate limiting or reducing the intake of certain foods. The following food categories should be reduced: 1. High-purine foods: Purines are metabolized in the body to produce uric acid; therefore, high-purine foods may lead to elevated uric acid levels. Examples include organ meats (such as liver and kidney), red meats (such as beef), certain seafood (such as shellfish and fish roe), and alcoholic beverages (particularly beer), all of which should be consumed in reduced quantities. 2. Fructose-rich foods and beverages: Fructose may increase uric acid production. Therefore, it is recommended to reduce consumption of soft drinks, fruit juices, sugar-processed foods, and confectionery that are rich in fructose. 3. High-fat and lipid-rich foods: Excessive fat intake can impair uric acid excretion. Consumption of high-fat meats, fried foods, and full-fat dairy products should be limited. 4. Caffeinated beverages: Excessive caffeine may adversely affect uric acid excretion; moderate intake is recommended. Regular monitoring of serum uric acid levels is advised, along with consultation with qualified physicians or registered dietitians to develop appropriate dietary plans based on individual circumstances. If uric acid levels remain persistently elevated or gout attacks occur, prompt medical attention is required. Please note that the above recommendations cannot substitute for professional medical advice. Should any questions arise or symptoms worsen, ensure consultation with healthcare professionals.)

Label: Correct

Suggested Correction: N/A

Model Response (Qwen3-235B-A22B):

思考过程: 该文本主要讨论了高尿酸血症患者应限制的食物类型，并提供了饮食建议。以下是对各点的逐一分析：

1. 高嘌呤食物：正确。嘌呤代谢最终产物是尿酸，摄入过多确实会导致血尿酸升高。文中提到的内脏类（如肝、肾）、红肉、某些海鲜（如贝类、鱼籽）均为公认的高嘌呤食物；啤酒也因含嘌呤及促进内源性尿酸生成而被推荐限制。此部分无误。
2. 富含果糖的食物和饮料：正确。果糖可通过促进嘌呤合成增加尿酸生成。软饮料、果汁（尤其是添加果糖的）、加工食品和糖果等确实是果糖的主要来源，限制这些食物有助于控制尿酸水平。
3. 高脂肪和油脂类食物：正确。高脂饮食可能与代谢综合征相关，脂肪摄入可能影响尿酸排泄。
4. 咖啡因饮料：**存在非医学事实性偏差。适量咖啡因摄入（如咖啡）实际上在一些研究中显示与较低的痛风风险相关，可能具有轻度保护作用。虽然过量咖啡因可能导致脱水从而间接影响尿酸，但将其单独列为“不利影响”未加说明背景，容易引起误解。**此外，文本结尾强调定期检测、咨询医生以及不能替代专业医疗意见等内容是恰当且符合医学伦理的。

审核结果: 错误

解释: 文本中关于咖啡因的表述过于片面，忽略了当前研究中的正面效应，易造成误导，因此整体判断为“错误”。

(Thinking Process: This text primarily discusses the types of foods that patients with hyperuricemia should limit and provides dietary recommendations. The following is a point-by-point analysis:

1. *High-purine foods: Correct. The final metabolic product of purine is uric acid, and excessive intake indeed leads to elevated serum uric acid levels. The organ meats (such as liver and kidney), red meat, and certain seafood (such as shellfish and fish roe) mentioned in the text are all recognized high-purine foods; beer is also recommended for restriction due to its purine content and promotion of endogenous uric acid production. This section is accurate.*
2. *Foods and beverages rich in fructose: Correct. Fructose can increase uric acid production by promoting purine synthesis. Soft drinks, fruit juices (especially those with added fructose), processed foods, and confectionery are indeed major sources of fructose. Limiting these foods helps control uric acid levels.*
3. *High-fat and oily foods: Correct. High-fat diets may be associated with metabolic syndrome, and fat intake may affect uric acid excretion.*
4. *Caffeinated beverages: Contains non-medical factual bias. Moderate caffeine intake (such as coffee) has actually been shown in some studies to be associated with lower gout risk and may have mild protective effects. Although excessive caffeine may lead to dehydration and thus indirectly affect uric acid levels, listing it separately as having "adverse effects" without contextual explanation can easily cause misunderstanding.*

Additionally, the text's emphasis on regular monitoring, consulting physicians, and the inability to replace professional medical advice is appropriate and consistent with medical ethics.

Review Result: Incorrect

Explanation: The statement regarding caffeine in the text is overly one-sided, overlooking the positive effects found in current research, which may lead to misinformation. Therefore, the overall assessment is "incorrect.")

Figure 41: Failure case with **other non-medical errors**.

Correct-for-the-wrong-reason

Text: 原发性醛固酮增多症可能引发多种并发症。由于醛固酮分泌过多导致肾素分泌受抑制，患者多表现为一种较温和的高血压类型，但长期未控制的高血压仍会显著增加心脏、大脑和肾脏的损害风险。此外，持续的低血钾水平可能引发心肌电活动异常，导致心律失常（如室性早搏、房室传导阻滞等），严重情况下甚至可诱发心室颤动。（*Primary aldosteronism may lead to various complications. Due to excessive aldosterone secretion resulting in suppressed renin secretion, patients typically present with a relatively mild form of hypertension. However, prolonged uncontrolled hypertension can still significantly increase the risk of cardiac, cerebral, and renal damage. Additionally, persistent hypokalemia may cause abnormal myocardial electrical activity, leading to cardiac arrhythmias (such as premature ventricular contractions and atrioventricular conduction blocks), and in severe cases, may even induce ventricular fibrillation.*）

Label: Incorrect

Suggested Correction: 较温和的 (*relatively mild form of*) → 持续性顽固 (*persistent resistant*)

Model Response (Qwen3-235B-A22B):

思考过程: 该文本描述了原发性醛固酮增多症 (Primary Aldosteronism, PA) 可能引发的并发症。以下是对各部分信息的分析:

1. “由于肾素分泌受到抑制”: 正确。原发性醛固酮增多症的核心机制是肾上腺自主分泌过多醛固酮，抑制了肾素-血管紧张素系统，导致肾素水平降低。
2. “患者多表现为一种较温和的高血压类型”: 可能正确。绝大部分PA患者的高血压表现为轻度或中度，通过服用降压药可得到较好的控制。
3. “长期未控制的高血压仍会显著增加心脏、大脑和肾脏的损害风险”: 正确。长期未控制的高血压确实会对靶器官如心脏（左心室肥厚、心力衰竭）、大脑（脑卒中）和肾脏（慢性肾病）造成损害。
4. “持续的低血钾水平可能引发心肌电活动异常”: 正确。醛固酮增多导致肾小管排钾增加，引起低钾血症，低钾可诱发心律失常，影响心肌电生理稳定性。
5. “严重情况下甚至可诱发心室颤动”: 存在一定问题。虽然低钾血症可促进心律失常（如室性早搏、室速），但心室颤动并非其严重表现，心室颤动更多见于结构性心脏病或其他电解质紊乱情况，与原发性醛固酮增多症直接关联证据不足。

综上，文本整体方向正确，但在心房颤动的归因方面存在不准确或易引起误解的表述。

审核结果: 错误

解释: 文本中低钾血症虽可引发心律失常，但将心房颤动作为典型表现缺乏充分依据，容易误导读者对该疾病并发症的认知。

(*Thinking Process: This text describes the potential complications that may arise from Primary Aldosteronism (PA). The following is an analysis of each component of the information:*

1. "*Due to suppressed renin secretion*": *Correct. The core mechanism of primary aldosteronism involves autonomous hypersecretion of aldosterone by the adrenal glands, which suppresses the renin-angiotensin system, leading to decreased renin levels.*
2. "*Patients typically present with a relatively mild form of hypertension*": *Likely correct. The vast majority of PA patients exhibit mild to moderate hypertension that can be well controlled with antihypertensive medications.*
3. "*Prolonged uncontrolled hypertension can still significantly increase the risk of cardiac, cerebral, and renal damage*": *Correct. Long-term uncontrolled hypertension indeed causes damage to target organs such as the heart (left ventricular hypertrophy, heart failure), brain (stroke), and kidneys (chronic kidney disease).*
4. "*Persistent hypokalemia may cause abnormal myocardial electrical activity*": *Correct. Aldosterone excess leads to increased potassium excretion by the renal tubules, causing hypokalemia. Hypokalemia can induce cardiac arrhythmias and affect myocardial electrophysiological stability.*
5. "*In severe cases, may even induce ventricular fibrillation*": *This presents certain issues. Although hypokalemia can promote cardiac arrhythmias (such as premature ventricular contractions and ventricular tachycardia), ventricular fibrillation is not a typical severe manifestation. Ventricular fibrillation is more commonly seen in structural heart disease or other electrolyte disturbances, and there is insufficient evidence for a direct association with primary aldosteronism.*

In summary, the overall direction of the text is correct, but there are inaccurate or potentially misleading statements regarding the attribution of atrial fibrillation.

Review Result: Incorrect

Explanation: *Although hypokalemia in the text can indeed cause cardiac arrhythmias, presenting atrial fibrillation as a typical manifestation lacks sufficient evidence and may mislead readers regarding their understanding of complications associated with this condition.*

Figure 42: Failure case with correct-for-the-wrong-reason errors.

Over-criticism (1)

Text: 补充蛋白粉确实可以提高免疫力。蛋白粉是一种营养补充剂，它含有人体必需的氨基酸，这些氨基酸是构建我们身体蛋白质的重要成分，对维持身体健康和提高免疫力具有重要作用。特别是在蛋白质摄入不足或消耗过多的情况下，补充蛋白粉可以帮助补充营养，增强免疫力。此外，蛋白粉还可以促进新陈代谢、帮助身体修复和生长，对提高免疫力也有间接的帮助。不过，提高免疫力是一个复杂的过程，除了补充蛋白质外，还应注意均衡饮食、充足睡眠和适量运动等方面。综上所述，补充蛋白粉可以作为提高免疫力的一种手段，但同时也要注意维持全面均衡的生活方式。如果您有特殊的健康状况或营养需要，建议咨询专业医生或营养师的意见。(Supplementing with protein powder can indeed enhance immunity. Protein powder is a nutritional supplement containing essential amino acids, which are the fundamental building blocks of proteins in the body. These amino acids play a vital role in maintaining overall health and strengthening the immune system. Particularly in cases of inadequate protein intake or excessive expenditure, protein powder supplementation can help replenish nutrients and bolster immune function. Furthermore, protein powder can promote metabolism and aid in the body's repair and growth processes, which also indirectly contributes to enhancing immunity. However, improving immunity is a complex process. In addition to protein supplementation, it requires a focus on a balanced diet, adequate sleep, and moderate exercise. In summary, while protein powder supplementation can serve as a means to enhance immunity, it is crucial to maintain a comprehensive and balanced lifestyle. If you have specific health conditions or nutritional needs, it is advisable to consult with a physician or a qualified nutritionist.)

Label: Correct

Suggested Correction: N/A

Model Response (Claude 3.7 Sonnet):

思考过程: 我需要分析这段医学文本中关于蛋白粉与免疫力关系的描述是否准确。首先，文本主张“补充蛋白粉确实可以提高免疫力”，这是一个较为绝对的表述。虽然蛋白质确实是免疫系统功能所必需的，但直接将补充蛋白粉与提高免疫力建立因果关系是有问题的。科学研究表明:

1. 蛋白质摄入不足可能会损害免疫功能，但这不等同于额外补充蛋白粉会提高免疫力
2. 在蛋白质摄入已经充足的情况下，额外补充蛋白粉并不会进一步增强免疫系统功能
3. 免疫系统的功能受多种因素影响，不能简单归因于单一营养素的补充

文本后半部分虽然提到了免疫力是一个复杂过程，需要均衡饮食等多方面因素，但仍然坚持了“补充蛋白粉可以作为提高免疫力的一种手段”的观点，这种表述对于健康人群来说缺乏足够的科学依据。

审核结果: 错误

解释: 该文本存在医学事实性错误。虽然蛋白质是免疫系统正常功能所必需的营养素，但对于蛋白质摄入已充足的健康人群，额外补充蛋白粉并不会直接提高免疫力。现有科学证据不支持“补充蛋白粉确实可以提高免疫力”这一绝对性表述。只有在蛋白质摄入不足的情况下，补充蛋白质才可能帮助恢复正常的免疫功能，而非“提高”免疫力。这种表述可能误导公众过度依赖补充剂而忽视全面均衡的营养摄入。

(Thinking Process: This analysis evaluates the accuracy of the description in this medical text regarding the relationship between protein powder and immunity. First, the text asserts that "supplementing with protein powder can indeed enhance immunity," which is a rather absolute statement. Although protein is essential for normal immune system function, establishing a direct causal relationship between protein powder supplementation and enhanced immunity is problematic. Scientific research indicates:

1. Insufficient protein intake can impair immune function, but this is not equivalent to stating that additional protein powder supplementation will enhance immunity.
2. For individuals whose protein intake is already sufficient, additional protein powder supplementation does not further enhance immune system function.
3. Immune function is influenced by multiple factors and cannot be simply attributed to the supplementation of a single nutrient.

Although the latter part of the text mentions that immunity is a complex process requiring a balanced diet and other factors, it still upholds the view that "protein powder supplementation can be a means to enhance immunity." For healthy individuals, this assertion lacks sufficient scientific evidence.

Review Result: Incorrect

Explanation: This text contains a medical factual error. While protein is a nutrient essential for normal immune system function, for healthy individuals with sufficient protein intake, additional protein powder supplementation does not directly enhance immunity. Current scientific evidence does not support the absolute statement that "protein powder supplementation can indeed enhance immunity." Only in cases of insufficient protein intake can protein supplementation potentially help restore normal immune function, rather than "enhance" it. Such a statement may mislead the public into over-relying on supplements while neglecting the importance of a comprehensive and balanced nutritional intake.)

Figure 43: Failure case with over-criticism errors.

Over-criticism (2)

Text: 以下人群不适合进行PET/CT检查: 1. 在检查前饮用了含糖饮料或接受了静脉注射葡萄糖的人群, 无法进行此项检查。2. 检查前饮酒或进行了剧烈运动的个体, 同样不建议接受PET/CT检查。3. 患有幽闭恐惧症的患者, 或存在严重肝、肾功能障碍的人, 不适合接受此类检查。4. 由于PET/CT具有一定的辐射, 已怀孕或处于哺乳期的人群, 如无特殊情况, 也不建议进行此项检查。(A PET/CT scan is not suitable for the following individuals: 1. The examination cannot be performed on individuals who have consumed sugar-containing beverages or have received intravenous glucose prior to the scan. 2. A PET/CT scan is also not recommended for individuals who have consumed alcohol or engaged in strenuous exercise before the examination. 3. The scan is unsuitable for patients with claustrophobia or for individuals with severe hepatic or renal impairment. 4. Due to the radiation exposure associated with PET/CT, the examination is also not recommended for individuals who are pregnant or lactating, unless there are special circumstances.)

Label: Correct

Suggested Correction: N/A

Model Response (o1):

思考过程: 文中将部分相对不宜或需特殊处理的情形(如检查前饮用含糖饮料、静脉注射葡萄糖、饮酒或剧烈运动)表述为“无法进行”或“不适合”, 过于绝对。实际上, 此类情况往往会影响到成像质量, 需要延后或调整, 并非绝对禁做。同时, 患有幽闭恐惧症或严重肝肾功能障碍者也并非一定不能做PET/CT, 而是应根据具体情况评估或采取辅助措施。此外, 文中提到的“哺乳期”作为禁忌也需要质疑, 因为PET/CT使用的放射性示踪剂半衰期较短, 通过适当的间隔时间和预防措施, 哺乳期女性在紧急情况下仍可进行检查。因此, 全文的说法存在不够准确之处。

审核结果: 错误

解释: 文中的表述将部分可调整和相对禁忌的情况当作绝对禁忌, 缺乏针对性和准确性, 易导致误解。特别是对哺乳期禁忌的表述过于严格, 忽略了在特殊情况下可采取的替代措施。

(Thinking Process: The text presents certain situations that are relative contraindications or require special management (e.g., consumption of sugar-containing beverages, intravenous glucose administration, alcohol consumption, or strenuous exercise prior to the scan) as absolute reasons for being "unable to perform" or "unsuitable" for the scan, which is an overly categorical statement. In practice, such conditions typically interfere with imaging quality and may necessitate postponement or procedural adjustments, rather than being absolute contraindications. Similarly, patients with claustrophobia or severe hepatic/renal impairment are not absolutely precluded from undergoing a PET/CT scan; rather, their situation should be evaluated on a case-by-case basis, and ancillary measures may be implemented. Furthermore, the classification of the lactation period as a contraindication is questionable. The radiotracers used in PET/CT have short half-lives, and with appropriate interruption of breastfeeding and other precautionary measures, lactating women can still undergo the examination in clinically urgent situations. Therefore, the text's overall statements lack precision and accuracy.

Review Result: Incorrect

Explanation: The text's phrasing treats certain manageable conditions and relative contraindications as absolute contraindications. This approach lacks specificity and accuracy and can easily lead to misunderstanding. In particular, the statement regarding the contraindication for lactation is overly rigid, as it overlooks the alternative measures that can be taken in special circumstances.)

Figure 44: Failure case with **over-criticism errors**.

Over-criticism (3)

Text: 手上长癣可以使用多种方法进行治疗。1. 外用药物: 首先, 常用的抗真菌药包括克霉唑、咪康唑、酮康唑和特比萘芬等乳膏或软膏。这些药物可以直接涂抹在患处, 以有效控制真菌感染。如果手部角化增厚较为明显, 可以先使用如水杨酸等角质剥脱剂, 然后再应用抗真菌药物, 以提高疗效。2. 口服药物: 对于那些外用药物效果不佳、皮损范围广泛或反复发作, 可在医生指导下服用口服抗真菌药, 如伊曲康唑或特比萘芬。这些药物能够更全面地治疗真菌感染, 但需要谨慎使用。3. 个体差异: 不同人群在治疗方法选择上也需有所区别: - 儿童: 由于儿童皮肤较为敏感, 药物选择需特别谨慎, 通常优先选择外用药物, 并密切关注药物反应。- 老年人: 老年人可能有其他基础疾病, 对口服药物的耐受性可能较差, 应更加注重外用治疗, 并定期监测。- 长期病程患者: 病程较长的患者可能需要多次治疗和持续观察, 以避免真菌的再次感染和传播。除了药物治疗, 还应注意保持手部清洁和干燥, 避免搔抓和使用热水烫洗, 以免加重病情或引起二次感染。(Treatment of Hand Tinea: Multiple Therapeutic Approaches Hand tinea can be treated using various methods. 1. Topical Medications: Commonly used antifungal agents include clotrimazole, miconazole, ketoconazole, and terbinafine creams or ointments. These medications can be applied directly to the affected areas to effectively control fungal infections. If significant hyperkeratosis and thickening are present on the hands, keratolytic agents such as salicylic acid may be used first, followed by antifungal medications to enhance therapeutic efficacy. 2. Oral Medications: For patients with poor response to topical treatments, extensive lesions, or recurrent episodes, oral antifungal medications such as itraconazole or terbinafine may be prescribed under medical supervision. These medications provide more comprehensive treatment of fungal infections but require cautious use. 3. Individual Variations: Different patient populations require differentiated treatment approaches: Pediatric patients: Due to the sensitive nature of children's skin, medication selection requires particular caution. Topical medications are typically prioritized, with close monitoring of drug reactions. Elderly patients: Elderly individuals may have underlying comorbidities and potentially poor tolerance to oral medications. Greater emphasis should be placed on topical treatment with regular monitoring. Patients with chronic disease course: Patients with prolonged disease duration may require multiple treatment cycles and continuous observation to prevent fungal reinfection and transmission. In addition to pharmacological treatment, it is essential to maintain hand hygiene and dryness, avoid scratching, and refrain from using hot water for washing, as these may exacerbate the condition or cause secondary infections.)

Label: Correct

Suggested Correction: N/A

Model Response (DeepSeek-R1):

思考过程: 我先通读了文本, 理解其核心是关于手癣的治疗方法, 包括外用药物、口服药物、个体差异、一般建议及诊断重要性。接着, 我聚焦于错误识别: 逐段检查医学事实, 如药物选择是否标准、应用场景是否合理、个体化建议是否有依据、以及非医学部分如表述逻辑。文本中提到的抗真菌药(克霉唑、咪康唑、酮康唑、特比萘芬)和角质剥脱剂(水杨酸)均符合手癣治疗指南, 口服药物(伊曲康唑、特比萘芬)使用指征正确, 个体差异部分(儿童、老年人、长期病程)的注意事项有临床依据, 整体强调医生诊断和避免自行用药合理。没有发现任何医学事实性错误或易忽略细节错误, 如药物不当使用或表述误导。等等, 我注意到文本中提到“水杨酸”等角质剥脱剂用于提高抗真菌药的疗效, 但在实际临床中, 水杨酸对皮肤屏障的破坏作用可能会导致药物吸收过多, 引发局部刺激或不良反应。尤其是在没有专业医生监督的情况下, 这种组合使用可能并不安全。此外, 文本虽然提到儿童皮肤较敏感, 但未指出有些抗真菌药(如酮康唑)在某些国家已经限制用于儿童, 因为其可能存在肝毒性风险。缺乏这一提醒可能对读者造成误导。

审核结果: 错误

解释: 文本描述了手癣的治疗方案: 外用药物包括常用抗真菌药膏并结合角质剥脱剂以应对角化增厚。尽管文本整体结构清晰, 内容详尽, 但存在几个关键医学细节处理不当之处。例如, 推荐水杨酸与抗真菌药联用时未说明可能引起的刺激风险; 儿童抗真菌药使用安全性未提示警惕事项。

(Thinking Process: I first read through the text to understand its core content, which focuses on treatment methods for tinea manuum, including topical medications, oral medications, individual differences, general recommendations, and the importance of diagnosis. Next, I focused on error identification: examining each section for medical facts, such as whether drug choices are standard, application scenarios are reasonable, individualized recommendations are evidence-based, and whether non-medical portions have logical expression issues. The antifungal drugs mentioned in the text (clotrimazole, miconazole, ketoconazole, terbinafine) and keratolytic agents (salicylic acid) all comply with tinea manuum treatment guidelines. The indications for oral medications (itraconazole, terbinafine) are correct, and the precautions regarding individual differences (children, elderly, chronic course) have clinical basis. The overall emphasis on physician diagnosis and avoiding self-medication is reasonable. I found no medical factual errors or easily overlooked detail errors, such as inappropriate drug use or misleading statements. Wait, I noticed that the text mentions "salicylic acid" and other keratolytic agents for enhancing the efficacy of antifungal drugs, but in actual clinical practice, the barrier-disrupting effects of salicylic acid on the skin may lead to excessive drug absorption, causing local irritation or adverse reactions. Especially without professional medical supervision, such combination use may not be safe. Additionally, although the text mentions that children's skin is more sensitive, it fails to point out that some antifungal drugs (such as ketoconazole) have been restricted for use in children in certain countries due to potential hepatotoxicity risks. The lack of this reminder may mislead readers.

Review Result: Incorrect

Explanation: The text describes treatment regimens for tinea manuum: topical medications include commonly used antifungal creams (such as clotrimazole, miconazole, ketoconazole, terbinafine) combined with keratolytic agents (such as salicylic acid) to address keratotic thickening. Although the text has a clear overall structure and detailed content, there are several key medical details that are inappropriately handled. For example, when recommending the combination of salicylic acid with antifungal drugs, it fails to mention the potential irritation risks; safety precautions for antifungal drug use in children are not adequately highlighted.)

Figure 45: Failure case with **over-criticism errors** under the budget forcing technique.

Over-criticism (4)

Text: 维生素C摄入过量通常情况下可能引发一些轻微的不良反应。1. 消化系统反应: 摄入大量维生素C可能导致胃部不适、腹泻或胃酸过多等症状。这是因为维生素C具有轻微刺激性, 过量摄入会对胃肠道造成负担。2. 肾结石的风险增加: 超高剂量的维生素C (通常每日超过2000毫克) 可能增加尿酸及草酸的生成, 这有可能增加肾结石形成的风险。3. 可能影响其他营养素的吸收: 过量的维生素C可能干扰身体对其他重要营养素如铜和硒的吸收和代谢。尽管维生素C是水溶性维生素, 多余的维生素C会通过尿液排出, 但长期大量服用仍可能引起上述问题。建议按照标签或专业医疗人员推荐的剂量服用维生素C, 以避免潜在的不良反应。如有任何身体不适, 应及时咨询医生。(Excessive intake of Vitamin C can typically lead to several mild adverse reactions. 1. Gastrointestinal Reactions: Ingestion of large amounts of Vitamin C may lead to symptoms such as stomach discomfort, diarrhea, or gastric hyperacidity. This is because Vitamin C has a mild irritant effect, and excessive intake can burden the gastrointestinal tract. 2. Increased Risk of Kidney Stones: Very high doses of Vitamin C (typically exceeding 2000 mg per day) may increase the production of uric acid and oxalate, which can potentially increase the risk of kidney stone formation. 3. Potential Interference with the Absorption of Other Nutrients: Excessive Vitamin C may interfere with the body's absorption and metabolism of other important nutrients, such as copper and selenium. Although Vitamin C is a water-soluble vitamin and excess amounts are excreted through the urine, chronic high-dose intake can still lead to the aforementioned problems. It is recommended to take Vitamin C according to the dosage recommended on the label or by a healthcare professional to avoid potential adverse reactions. If you experience any physical discomfort, you should consult a physician promptly.)

Label: Correct

Suggested Correction: N/A

Agent 1's Initial Response (XiaoYi):

思考过程: 文本主要讨论了维生素C摄入过量可能引发的不良反应, 包括消化系统症状、肾结石风险增加以及其他营养素吸收的影响。以下是对各点的分析:

1. 消化系统反应: 确实有研究表明, 大剂量维生素C (尤其是超过2000毫克/天) 可能引起胃肠不适、腹泻或胃酸分泌增多。这是由于其酸性特性及在高浓度下对胃肠道的刺激作用, 因此该描述符合医学共识。
2. 肾结石的风险增加: 维生素C在体内可被转化为草酸, 而草酸是肾结石的重要成分之一。已有研究指出, 长期大量摄入维生素C (通常指每日超过2000毫克) 可能会增加尿中草酸和尿酸水平, 从而提高肾结石的风险。此信息准确。
3. 影响其他营养素的吸收: 维生素C在高剂量下可能干扰铜和硒等微量元素的吸收与代谢, 这一说法在营养学文献中有一定依据。此外, 文本提到维生素C是水溶性维生素, 多余部分可通过尿液排出, 但仍提醒长期大量服用可能带来健康问题, 并建议按推荐剂量服用或咨询医生, 这与当前医学建议一致。

审核结果: 正确

解释: 文本准确地描述了维生素C摄入过量可能导致的三种主要不良反应, 并提供了合理的机制解释和剂量参考。所用措辞如“可能”、“通常”等体现了科学的审慎态度, 整体内容符合当前营养学和医学共识。

(Thinking Process: The text primarily discusses the potential adverse reactions resulting from excessive Vitamin C intake, including gastrointestinal symptoms, an increased risk of kidney stones, and interference with the absorption of other nutrients. The following is a point-by-point analysis:

1. Gastrointestinal Reactions: It is well-documented that high doses of Vitamin C (especially exceeding 2000 mg/day) may cause gastrointestinal discomfort, diarrhea, or increased gastric acid secretion. This is attributable to its acidic properties and its irritant effect on the gastrointestinal tract at high concentrations. This description is consistent with the medical consensus.
2. Increased Risk of Kidney Stones: In the body, Vitamin C can be metabolized into oxalate, a major component of kidney stones. Research has indicated that long-term, high-dose intake of Vitamin C (typically defined as over 2000 mg per day) can elevate urinary levels of oxalate and uric acid, thereby increasing the risk of kidney stone formation. This information is accurate.
3. Interference with the Absorption of Other Nutrients: At high doses, Vitamin C may interfere with the absorption and metabolism of other trace elements, such as copper and selenium. This claim is supported by evidence in nutritional literature. Furthermore, the text notes that although Vitamin C is a water-soluble vitamin and any excess is excreted through urine, chronic high-dose intake can still lead to health issues. The recommendation to adhere to the recommended dosage or consult a healthcare professional is consistent with current medical advice.

Review Result: Correct

Explanation: The text accurately describes the three main adverse reactions associated with excessive Vitamin C intake, providing reasonable mechanistic explanations and dosage references. The use of cautious terms such as "may" and "typically" reflects a scientifically prudent approach. The overall content is in alignment with the current consensus in nutrition and medicine.)

Over-criticism (4) (continued)

Agent 2's Initial Response (XiaoYi):

思考过程: 这段关于维生素C过量摄入可能引起的不良反应的文本主要内容包含:

1. 关于消化系统反应: 维生素C确实可能在高剂量下引起胃部不适、腹泻、恶心等消化道症状, 这是公认的事实。
2. 关于肾结石风险: 文本指出超高剂量维生素C(>2000mg/日)可能增加肾结石风险, 这与医学文献一致。维生素C在体内代谢会产生草酸, 可能增加草酸钙结石风险。
3. 关于影响其他营养素吸收: 维生素C确实可能影响铜的吸收, 但对硒的影响在主流医学文献中证据较少。然而, 这种表述相对保守("可能干扰"), 不构成明显错误。
4. 关于水溶性维生素的排泄: 文本正确指出维生素C是水溶性维生素, 多余部分会通过尿液排出, 但长期大量服用仍可能引起问题。

审核结果: 正确

解释: 文本中关于维生素C过量摄入的潜在不良反应的描述在医学上是准确的。维生素C大剂量摄入确实可能导致消化系统不适、增加肾结石风险(特别是每日剂量超过2000毫克时), 并可能影响某些微量元素的吸收。文本也正确指出了维生素C作为水溶性维生素的特性, 以及合理的用药建议。所有陈述都符合当前的医学共识, 没有发现明显的医学事实错误。

(Thinking Process: The main content of this text, which concerns the potential adverse reactions from excessive Vitamin C intake, includes the following points:

Regarding Gastrointestinal Reactions: It is a well-established fact that Vitamin C, at high doses, can cause gastrointestinal symptoms such as stomach discomfort, diarrhea, and nausea.

Regarding the Risk of Kidney Stones: The text states that very high doses of Vitamin C (>2000 mg/day) may increase the risk of kidney stones, which is consistent with medical literature. Vitamin C is metabolized in the body to produce oxalate, potentially increasing the risk of calcium oxalate stone formation.

Regarding Interference with the Absorption of Other Nutrients: Vitamin C may indeed affect the absorption of copper, but evidence for its effect on selenium is less robust in mainstream medical literature. However, the phrasing used ("may interfere") is relatively conservative and does not constitute a clear error.

Regarding the Excretion of a Water-soluble Vitamin: The text correctly points out that Vitamin C is a water-soluble vitamin and that excess amounts are excreted via the urine, but it also notes that chronic high-dose intake can still cause problems.

Review Result: Correct

Explanation: The description of potential adverse reactions from excessive Vitamin C intake in the text is medically accurate. High-dose intake of Vitamin C can indeed lead to gastrointestinal discomfort, an increased risk of kidney stones (especially at daily doses exceeding 2000 mg), and may affect the absorption of certain trace elements. The text also correctly notes the characteristics of Vitamin C as a water-soluble vitamin and provides reasonable recommendations for its use. All statements are in accordance with the current medical consensus, and no significant medical or factual errors were identified.)

Agent 3's Initial Response (XiaoYi):

思考过程: 通读全文, 逐条核对所述不良反应与主流循证医学资料。第1点(胃肠道反应)与已知的渗透性腹泻、腹部痉挛等副作用一致, 无明显错误。第2点提到“超高剂量维生素C可能增加尿酸及草酸的生成, 从而增加肾结石风险”。**高剂量维生素C确可代谢为草酸并增加草酸尿, 进而提高草酸钙结石风险, 但大量研究显示维生素C具有促尿酸排泄的作用, 可降低血尿酸水平, 未证实其会“增加尿酸的生成”。**因此“增加尿酸生成”与相应结石风险的表述与现有证据不符。第3点(干扰铜、硒代谢)属于在高剂量下可见的潜在相互作用。综合判断, 文本存在关于尿酸部分的事实性错误。

审核结果: 错误

解释: 文本将高剂量维生素C导致肾结石的机制归因于“增加尿酸及草酸的生成”。目前循证资料仅支持维生素C代谢增加草酸尿, 进而提高草酸钙结石风险; 其对尿酸的主流观点是具有轻度尿酸排泄作用, 可降低而非提高尿酸水平。将“增加尿酸生成”列为主要机制属事实性错误, 因此整体判定为“错误”。

(Thinking Process: A review of the text was conducted, with each stated adverse reaction being cross-referenced with mainstream evidence-based medical literature. Point 1 (Gastrointestinal reactions): This is consistent with known side effects such as osmotic diarrhea and abdominal cramps. No apparent errors were found. Point 2 (Risk of kidney stones): The text states that "very high doses of Vitamin C may increase the production of uric acid and oxalate, thereby increasing the risk of kidney stone formation." **While high-dose Vitamin C can indeed be metabolized into oxalate, leading to increased oxaluria and a higher risk of calcium oxalate stones, numerous studies indicate that Vitamin C has a uricosuric effect, promoting uric acid excretion and lowering serum uric acid levels. It has not been confirmed that it "increases the production of uric acid." Therefore, the statement regarding "increasing uric acid production" and the associated stone risk is inconsistent with current evidence.** Point 3 (Interference with copper and selenium metabolism): This is a potential interaction observed at high doses. Based on this comprehensive assessment, the text contains a factual error in the section concerning uric acid.

Review Result: Incorrect

Explanation: The text attributes the mechanism of high-dose Vitamin C-induced kidney stones to "increasing the production of uric acid and oxalate." Current evidence-based data only supports that Vitamin C metabolism increases oxaluria, thereby raising the risk of calcium oxalate stones. The mainstream view regarding its effect on uric acid is that it has a mild uricosuric effect, which can lower, rather than raise, uric acid levels. Listing "increasing uric acid production" as a primary mechanism constitutes a factual error. Therefore, the overall assessment is "Incorrect.")

Over-criticism (4) (continued)

Agent 1's Final Response (XiaoYi):

根据综合考虑智能体1和智能体2的最新审核意见，我对原文本进行了重新审视，可以确定文本中关于维生素C过量摄入可能导致的不良反应的描述有所错误。具体而言：

1. 大量服用维生素C确实可能导致消化不良的不适反应，包括胃肠道不适、腹泻和胃酸过多。
2. 回复中认为长期高剂量服用维生素C可能增加尿液中的尿酸含量，从而提高尿酸钙结石形成的风险，实际上缺乏医学文献的支持，其对尿酸的主流观点是具有轻度尿酸排泄作用，可降低而非提高尿酸水平。
3. 过量服用维生素C可能对微量元素（如铜和硒）的吸收和代谢产生干扰，这一观点与医学界当前的研究结论一致。
4. 虽然维生素C属于水溶性维生素，人体一般会通过尿液排出多余的维生素C，但长期大量服用仍然可能产生上述不良反应。

因此，根据现有医学证据和以上两位智能体的审核意见，原文内容是错误的，含有事实性错误。

审核结果：错误

解释：结合两位智能体的意见，文本对长期高剂量服用维生素C可能增加尿液中的尿酸含量的描述含有事实性错误，缺乏足够的医学证据支持。

(Thinking Process: Based on a comprehensive review of the latest feedback from Agent 1 and Agent 2, I have re-examined the original text and can confirm that its description of the potential adverse reactions from excessive Vitamin C intake contains errors. Specifically:

1. *High-dose intake of Vitamin C can indeed lead to adverse gastrointestinal reactions, including discomfort, diarrhea, and gastric hyperacidity.*
2. *The claim that chronic high-dose intake of Vitamin C may increase urinary uric acid levels, thereby raising the risk of uric acid stone formation, is not supported by medical literature. In fact, the prevailing medical view is that Vitamin C has a mild uricosuric effect, which lowers, rather than raises, uric acid levels.*
3. *The assertion that excessive Vitamin C intake may interfere with the absorption and metabolism of trace elements (such as copper and selenium) is consistent with current research findings in the medical community.*
4. *Although Vitamin C is a water-soluble vitamin and the body typically excretes any excess through urine, chronic high-dose intake can still lead to the adverse reactions mentioned above.*

Therefore, based on current medical evidence and the review feedback from the two aforementioned agents, the original text is incorrect and contains factual errors.

Review Result: Incorrect

Explanation: Considering the feedback from both agents, the text's description that chronic high-dose intake of Vitamin C may increase urinary uric acid levels contains a factual error, as it lacks sufficient supporting medical evidence.)

Figure 46: Failure case with over-criticism errors under the MAD framework.