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Assessing the Accuracy and Efficiency of ICD-10 Coding Among Medical Billing Professionals in Outpatient Settings at Makkah Region

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Abstract

ICD-10 coding has been the gold standard for treatment and diagnosis documentation for modern health systems. Outpatient clinics, with high volumes of brief patient encounters, are especially dependent on timely and accurate coding. Errors in coding threaten reimbursement legitimacy and affect health analytics, illness tracking, and patient safety. This study investigated ICD-10 coding inefficiency and error trends by coding professionals in the outpatient setting. The study was performed in a sample of five hospitals at Makkah region , with a 100-subject pool of certified and non-certified coders. A survey tool was employed for measuring errors by type, coding speed, frequency of training, and utilization of automated coding software. Results indicated a frequent challenge in handling poor physician documentation, excessive software aids use accompanied by manual verification, and lack of formal refresher training. Coders with experience exceeding five years performed consistently higher for both speed and accuracy. The findings justify the need for improved interdisciplinary communication, coder education, and stricter requirements for software dependency. Investing in increased resources on these items would improve outpatient coding practice reliability considerably.

Introduction

Medical coding is the clinical documentation's financial and informational backbone in the current healthcare environment. Of the different coding systems, the International Classification of Diseases, Tenth Revision (ICD-10) is renowned for its complexity and coverage and is used worldwide. However, this high degree of complexity poses considerable hurdles, especially within outpatient clinics, when encounters are brief and documentation incomplete (Chen et al., 2021). Outpatients are distinct from inpatients not only in brevity but also in the diversity and unpredictability of the work done, making it hard to make consistent, reliable code assignments. The work of billing personnel within this setting is taking frequently incomplete clinical interactions and assigning them exact diagnostic codes—a task requiring technical proficiency

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and clinical acuity.

Previous research has concentrated mainly on coding errors within hospital premises, but outpatient care represents a significant percentage of medical use, particularly for chronic diseases, preventive screenings, and minor procedures. However, outpatient coding is still under-researched (Utami et al., 2022). Further, software support for coders, which has been created, tends to be inadequate in replacing coders' judgment, particularly when source documents are poor or unclear. Coding errors can be responsible for rejected insurance claims, fraud detection, and misrepresentation of public health statistics.

This study aims to determine critical coding speed and accuracy bottlenecks among outpatient coders. More specifically, this research investigates how training, documentation quality, utilization of automated software, and experience on the part of the coder interactively affect coding performance. This research was carried out across a diverse portfolio of outpatient clinics across Illinois, ranging from family practices and dermatology offices to orthopedic and urgent care facilities. This study captures a representative view of actual coding practices. The ultimate aim is to provide actionable insights into enhanced outpatient coding outcomes, balancing speed and accuracy.

Methodology

Study Design and Setting

The data was collected using a cross-sectional, survey-based design from billing professionals employed within outpatient facilities (Cvetkovic-Vega et al., 2021). The study targeted ten independent outpatient clinics in five hospitals at Makkah region . Clinics were sampled for varying specialties and patient types. General family and dermatology clinics, minor surgery centers, and musculoskeletal treatment units constituted the sample. They processed between 50 and 200 encounters daily at each site, highlighting the necessity for rapid and accurate coding procedures.

Participants and Sampling Strategy

The research focused on non-certified and certified coding professionals with at least one year of full-time experience. Direct invitation and internal referral (snowball sampling) were used to enroll 100 participants. All coders working full-time for the clinics, remotely employed coders, and billing specialists within integrated revenue cycle management teams participated. Criteria for participation required consistent interaction with ICD-10 codes for outpatient documentations, and coders coding only for inpatients were excluded.

Survey Instrument

A structured survey instrument was created for this study (Appendix A). It was a five-part survey containing demographic data, training and experience background, frequency and nature of coding errors, average record completion time, and open-ended questions determining subjective coding difficulties. There were also questions regarding reliance on software, interpretation of ICD-10 revisions, and communication between clinical staff and coders on document clarity. The instrument was tested by a panel of three health information professionals and pilot-tested on ten coders to enhance clarity and content validity.

Procedure and Ethical Approval

The survey was distributed electronically through email, and a physical version was handed out

during on-site visits. The time required for completion was 20 to 30 minutes. Anonymous submission was allowed, and data was gathered using no identifiers The participants received written informed consent before soliciting their responses.

Findings

Demographic and Professional Characteristics

Of the 100 coders polled, 63 possessed a Certified Professional Coder (CPC) certification, and the other 37 were uncertified but had practical experience with ICD-10 use. The sample comprised 70 females and 30 males between 26 and 59. Most of them had coding experience between two and ten years, and 21 reported over a decade's experience. Clinics showed diversity, but 35 coders practiced at general practice clinics, 25 at dermatology clinics, 20 at urgent care, and 20 at orthopedic and endocrinology outpatient units. The majority reported practicing independently, but 28 reported practicing under the direction of a coding auditor or compliance officer.

Common Coding Errors and Contributing Factors

One of the most prevalent issues highlighted was the misuse of ICD-10 codes owing to incomplete or unclear physician documentation. In 59 instances, coders reported being unable to obtain a precise diagnosis from the documents and hence had to resort to selecting codes from the "symptoms and signs" category. This led to undercoding claims or denials. Another common problem mentioned was the misuse of combination codes. Forty-one participants reported that differentiating between codes needing combination notation and singular reporting was a common trend.

In addition, software dependency created issues. Of the 72 coders who had used auto-suggest software embedded within EHR systems, 39 reported that they seldom verified suggested codes, and the top reasons given for this were pressure for speed and software over-reliance. Non-verification was strongly related to coding mistakes and was specifically prevalent within emergency care facilities, given the high demand for a rapid turnover. Moreover, 48 participants reported confusion regarding yearly ICD-10 changes, particularly when coding for newly added diagnoses or condition-specific exclusions.

Frequency of Common Coding Issues Reported by Respondents (N=100)

Coding Issue	Number of Coders Affected	Observed Most In
Vague clinical documentation	59	Family practice, urgent care
Confusion with the combination code requirements	41	Dermatology, ortho clinics
Auto-coding reliance without manual verification	39	Urgent care, suburban clinics
Errors due to lack of training on ICD-10 updates	48	Across all settings

Efficiency and Time Allocation

Time to complete one outpatient record was also an important performance measure. Across all participants, 47 reported taking between five and seven minutes on average to encode one record.

Coders in high-volume clinics reported shorter times but also increased perceived stress and use of automation. Notably, coders coding for over a decade completed an average of four records per minute and had a significantly lower perceived error rate. A mere 12 coders reported routinely going over the documentation with physicians to clarify it, which indicates that interaction between clinicians and coders is likely to be limited.

Respondents were also queried regarding training refresher classes. A total of 38 reported having attended an ICD-10 refresher workshop or webinar over the last year. Those receiving routine training rated higher on self-assessed confidence and accuracy and more frequently flagged incomplete clinical notes instead of guessing.

Average Coding Time and Training Exposure by Experience Group

Experience Level	Avg. Time per Record	Recent Training (Yes/No)	Typical Error Count per Week
1–3 years (N=30)	7.1 minutes	12 / 18	6–9
4–9 years (N=49)	5.6 minutes	21 / 28	4–6
10+ years (N=21)	4.3 minutes	15 / 6	2–4

Discussion

This study highlights several interconnected challenges affecting ICD-10 coding accuracy and efficiency within outpatient clinics. First and foremost, the chronic issue of incomplete or unclear clinical documents severely impedes coders from assigning proper codes. Compared to inpatients, outpatient visits are typically short and may not provide detailed diagnostic data, compelling coders to use symptom-based codes or make educated decisions (Utami et al., 2022). Symptom-based guessing or coding also creates errors that negatively impact billing quality and precision of patient health records. Outpatient processes worsen the issue, with high-pressure and high-volume conditions in which the coders have to release large volumes of patient visits, and coding for visits out is also being carried out regularly. The research findings identify an omnipresent conflict between pace and precision in the vast majority of coders, which is further increased by the absence of real-time communication channels with physicians for clarifying unclear notes (Hamedani et al., 2021). This inconsistency undermines the financial viability of clinics through rejected claims and impacts the accuracy of health reporting data, which is necessary for planning resources and tracking epidemiology.

Another recurring motif is the two-edged quality of coding software for coding in the outpatient setting. While the tools can generate increased productivity in the form of recommended codes from clinical text, there is an alarming over-reliance found by this research in many coders on this type of automation (Schwarzkopf et al., 2024). Various staff confirmed the lack of proper manual review of software-generated codes, primarily due to the pressure of the volume of work and over-reliance on the technology. Still, software cannot adequately replicate the clinical subtlety required to apply combination codes, exclusions, or new guidelines. The danger is that automation can institutionalize inaccuracies rather than reduce errors when human review is not required (Simon et al., 2022). In addition, the implications of software are most evident in those facilities, like urgent care clinics, with high volumes, creating the lure of speedy production. This truth reinforces the need for outpatient facilities to use auto-coding programs as tools, for coders trained in reviewing software recommendations critically, and to be watchful for errors with the potential for compromising compliance and reimbursement.

The other key insight relates to the effect of experience and continuing education on coding

proficiency. The research discovered that coders with over a decade of experience coded more rapidly and with fewer errors than less experienced coders. This disparity showcases the role that cumulative knowledge, intuition, and experience dealing with ICD-10 complexity play in improving coding quality. Sadly, most clinics do little or nothing to standardize ICD-10 continuing training, and thus, most coders are unprepared for yearly changes and complicated coding situations. The absence of continued study exposes coding quality to vulnerabilities, especially as the classification system changes (Wang et al., 2023). The research also reported that having opportunities for mentoring between experienced and newcomer coders was common but may be an important way to hasten learning and minimize mistakes. The studies recognize the need for an integrated process that includes training, mentoring, and institutional support in conjunction with technological tools to enhance coder productivity and offer consistent outpatient billing reliability.

Conclusion

ICD-10 coding in the outpatient setting is prone to routine difficulties that detract from precision and productivity. These include inadequate physician documentation, coding update confusion, and the uncoordinated operation of software tools in the absence of manual input. Implementing efficient coders, biannual refresher classes, and improved communication between coders and providers were performance turning points. While software assists in productivity, it cannot substitute for the judgment required in reading complex clinical documentation. Outpatient clinics must invest in training programs, documentation clarity efforts, and feedback cycles to limit errors and enhance claim outcomes. In an environment where healthcare relies on clean data for payment and analytics, driving coding quality in the outpatient setting is not a choice but a necessity.

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Appendix A: ICD-10 Coding Practices in Outpatient Clinics

Section A: Demographic and Professional Information

1. What is your age?

   ___ years

2. What is your gender?

   ☐ Male ☐ Female ☐ Prefer not to say ☐ Other: _____

3. How many years of experience do you have as a medical coder?

   ☐ 1–3 years ☐ 4–6 years ☐ 7–10 years ☐ Over 10 years

4. Are you a Certified Professional Coder (CPC)?

   ☐ Yes ☐ No

5. What type of clinic or facility do you currently work in?

   ☐ General Practice ☐ Dermatology ☐ Urgent Care ☐ Orthopedic

   ☐ Other: _____

6. Do you work:

   ☐ On-site ☐ Remotely ☐ Both

Section B: ICD-10 Coding Practices

7. How long does it typically take to complete coding for a single outpatient encounter?

   ☐ Less than 5 minutes ☐ 5–7 minutes ☐ 8–10 minutes ☐ More than 10 minutes

8. How frequently do you encounter unclear or vague documentation from clinicians?

   ☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

9. When documentation is unclear, how do you typically proceed? *(Check all that apply)*

   ☐ Contact the provider for clarification

   ☐ Use symptom-based codes

☐ Make an educated guess

☐ Leave the case for review

☐ Other: _____

10. Do you use software that suggests ICD-10 codes based on clinical notes?

☐ Yes ☐ No

11. If yes, how often do you manually verify the software-suggested codes?

☐ Always ☐ Most of the time ☐ Sometimes ☐ Rarely ☐ Never

12. Do you regularly check for annual ICD-10 updates?

☐ Yes ☐ No

13. How do you stay updated with ICD-10 changes or clarifications? *(Check all that apply)*

☐ Formal training/workshops

☐ Online search (e.g., CMS, AAPC)

☐ Internal memos or emails

☐ Social media groups/forums

☐ Not updated regularly

Section C: Error Types and Frequency

14. In a typical week, how many coding errors are you made aware of (via audit, claim rejections, or internal review)?

☐ None ☐ 1–3 ☐ 4–6 ☐ More than 6

15. What are the most common types of errors you encounter? *(Check all that apply)*

☐ Using incomplete documentation

☐ Incorrect use of combination codes

☐ Selecting symptom codes when a diagnosis is present

☐ Over-reliance on automated coding tools

☐ Misinterpreting exclusions/inclusions

☐ Other: _____

16. Do you receive feedback on your coding accuracy from a supervisor, auditor, or peer?

    ☐ Frequently ☐ Occasionally ☐ Rarely ☐ Never

Section D: Training and Confidence

17. Have you participated in a formal ICD-10 training or refresher course in the past 12 months?

    ☐ Yes ☐ No

18. How confident do you feel in applying ICD-10 coding guidelines in your day-to-day tasks?

    ☐ Very confident ☐ Somewhat confident ☐ Neutral ☐ Not very confident ☐ Not confident at all

19. Would you benefit from additional training or structured support at work?

    ☐ Yes ☐ No ☐ Maybe

Section E: Open-Ended Responses

20. What is your biggest challenge in ICD-10 coding within your outpatient clinic?

    _____

21. What steps could be taken to improve coding accuracy and workflow?

    _____

22. Do you have any training, communication, or software use recommendations that could help fellow coders?

    _____