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# Development and Content Validation of a Clinical Coding Quality Audit Instrument: A Modified Delphi Study

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**ABSTRACT:**

Reliable clinical coding is fundamental to high-quality health information. However, existing clinical coding audit approaches remain heterogeneous, frequently focusing on isolated quality indicators and lacking comprehensive, content-validated instruments for systematically evaluating clinical coding quality. This study aimed to develop and establish the content validity of the Indonesian Clinical Coding Quality Audit Instrument (IAMPK). A methodological instrument development study was conducted using a two-round modified Delphi technique involving seven experts in clinical coding, health information management, and health informatics. Candidate indicators identified through a comprehensive literature review were refined through expert consensus, and content validity was evaluated using the Item Content Validity Index (I-CVI), Scale Content Validity Index (S-CVI/Ave and S-CVI/UA), and Aiken's V. The final IAMPK comprised six domains and 32 indicators encompassing coding accuracy, coding completeness, sequencing accuracy, compliance with coding standards, documentation quality, and claim impact. Consensus was achieved for all indicators after two Delphi rounds. The instrument demonstrated excellent content validity, with all content validity indices meeting or exceeding recommended thresholds, supporting its suitability as a multidimensional framework for clinical coding quality audit. The IAMPK provides a standardised, multidimensional, and content-validated framework for evaluating clinical coding quality. This instrument offers a strong foundation for future psychometric evaluation and implementation to support consistent clinical coding quality assessment and continuous quality improvement in health information management.

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## 1. INTRODUCTION

Clinical coding is a fundamental component of modern health information systems, transforming clinical documentation into standardised data through internationally recognised disease and procedure classification systems (World Health Organization [WHO], 2022). These standardised data provide the foundation for patient care, healthcare financing, quality measurement, epidemiological surveillance, clinical research, and health policy development, making clinical coding an essential function of health information management (Shepheard, 2020; Davis and Shepheard, 2024). As healthcare systems become increasingly digital and data-driven, the demand for accurate, complete, and standardised coded data continues to grow, reinforcing the strategic role of clinical coding in supporting reliable health information and organisational decision-making (Campbell & Giadresco, 2020; Davis and Shepheard, 2024). Despite its central role in healthcare, maintaining consistently high-quality clinical coding remains a persistent challenge for many healthcare organisations (Doktorchik et al., 2020; Hay et al., 2020).

The benefits of clinical coding can only be realised when coded data accurately and consistently represent the patient's clinical condition. Consequently, clinical coding quality has become a major concern in health information management because it directly influences the reliability of health data used for patient care, healthcare financing, quality measurement, epidemiological surveillance, clinical research, and health policy (Shepheard, 2020; Davis and Shepheard, 2024). High-quality clinical coding encompasses accurate code assignment, complete capture of clinically relevant information, appropriate sequencing of diagnoses and procedures, and compliance with established coding standards, ensuring that coded data faithfully reflect clinical documentation (World Health Organization [WHO], 2022; Shepheard, 2020). However, previous studies consistently report that coding quality remains affected by incomplete clinical documentation, variations in coding practice, coder competency, and organisational factors, resulting in inaccurate or incomplete coded data that may adversely affect reimbursement, health statistics, service planning, and healthcare decision-making (Doktorchik et al., 2020; Alonso et al., 2020; Hay et al., 2020). These continuing challenges highlight the need for systematic approaches to evaluate and improve clinical coding quality within healthcare organisations.

Ensuring high-quality clinical coding requires systematic evaluation to determine whether coded data accurately represent clinical documentation and comply with established classification standards. Clinical coding audit is widely recognised as a key quality assurance process that systematically evaluates the accuracy, completeness, sequencing, and standards compliance of coded health data while identifying documentation deficiencies and coding errors that may compromise data quality (Lam et al., 2008; Shepheard, 2020; Davis and Shepheard, 2024). Beyond detecting coding inaccuracies, clinical coding audits provide evidence to improve clinical documentation, strengthen coding consistency, support coder education, and enhance the reliability of health information for clinical, administrative, financial, and research purposes (Campbell & Giadresco, 2020; Hay et al., 2020). Consequently, clinical coding audit has become an essential component of health information quality improvement programmes and is increasingly recognised as a strategic mechanism for supporting reliable health information and organisational performance in modern healthcare systems.

Despite the recognised importance of clinical coding audits, existing audit approaches remain heterogeneous in their scope, assessment criteria, and implementation across healthcare organisations. Most published studies and audit practices primarily evaluate isolated aspects of coding quality, such as coding accuracy, documentation completeness, or reimbursement-related issues, rather than adopting a comprehensive framework that systematically assesses multiple dimensions of coding quality (Lam et al., 2008; Alonso et al., 2020; Doktorchik et al., 2020; Hay et al., 2020). Furthermore, while various audit checklists and local evaluation tools have been reported, evidence describing the systematic development and formal content validation of comprehensive clinical coding audit instruments remains limited (Boateng et al., 2018; DeVellis and Thorpe, 2021). Consequently, the absence of a standardised, multidimensional, and content-validated audit instrument limits the consistency, comparability, and credibility of clinical coding quality assessments across healthcare settings. Addressing this methodological gap is essential to strengthen quality assurance processes and support more reliable health information management practices.

To address these methodological limitations, this study developed the Indonesian Clinical Coding Quality Audit Instrument (IAMPK), a multidimensional audit instrument designed to support comprehensive evaluation of clinical coding quality. The instrument was developed through a systematic instrument development process informed by established methodological frameworks and refined through expert consensus and formal content validation to ensure its relevance, clarity, and content validity (Boateng et al., 2018; DeVellis and Thorpe, 2021). By integrating multiple dimensions of clinical coding quality into a

single structured audit framework, IAMPK is intended to facilitate more standardised, consistent, and credible coding quality assessments while supporting continuous quality improvement in health information management.

Therefore, this study aimed to develop and establish the content validity of the IAMPK for evaluating clinical coding quality in healthcare organisations. The resulting instrument is expected to provide a standardised and content-validated framework to support consistent clinical coding quality assessment and continuous quality improvement in health information management.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

This study employed an instrument development design to develop and establish the content validity of the Instrument for Auditing Clinical Coding Quality (IAMPK). The study followed a systematic multistage process consisting of problem identification, literature review, regulatory review, conceptual framework development, domain identification, item generation, expert consensus using a modified Delphi technique, and quantitative content validity evaluation. The development process was guided by internationally recognized principles for health measurement instrument development and content validity assessment.

The study was conducted in two sequential phases. The first phase focused on developing the conceptual framework and drafting the preliminary audit instrument through evidence synthesis from international clinical coding standards, published audit instruments, and Indonesian coding regulations. The second phase evaluated the relevance, clarity, and representativeness of each indicator through a two-round modified Delphi process involving an expert panel, followed by quantitative assessment of content validity using the Item Content Validity Index (I-CVI), Scale Content Validity Index (S-CVI), and Aiken's V coefficient.

### 2.2 Instrument Development

The Instrument for IAMPK was developed using a systematic, evidence-informed approach. The development process followed established principles of instrument development, in which conceptualisation, evidence synthesis, and item generation precede expert evaluation (Boateng et al., 2018; DeVellis and Thorpe, 2021). Rather than adapting a single existing audit instrument, concepts from multiple evidence sources were integrated to construct a multidimensional framework for evaluating clinical coding quality.

Instrument development commenced with problem identification through a review of published literature, existing coding audit approaches, and Indonesian regulatory requirements. Evidence was drawn from international disease classification standards, coding audit methodologies, coding quality indicator frameworks, clinical documentation integrity literature, reimbursement-related references, and national coding regulations (World Health Organization, 2016; Shepheard, 2020; Davis and Shepheard, 2024). The principal evidence sources underpinning each conceptual domain are summarised in Table 1.

**Table 1.** Principal Evidence Sources Underpinning the Conceptual Domains of IAMPK

| Domain | Principal evidence sources |
|---|---|
| Coding accuracy | WHO ICD-10; ICD-9-CM; Performance Indicators for Coding Quality (PICQ); Australian Coding Benchmark Audit (ACBA) |
| Coding completeness | PICQ; clinical coding quality literature |
| Sequencing accuracy | WHO ICD-10; PICQ; Indonesian INA-CBG coding guidelines |
| Compliance with coding standards | WHO ICD-10; ICD-9-CM; Ministry of Health Regulation No. 26/2021 |
| Documentation quality | Clinical documentation integrity literature; health information management literature |
| Claim impact | Casemix/INA-CBG literature; Ministry of Health Regulation No. 26/2021 |

Recurring concepts identified across the evidence sources were compared, grouped, and synthesised into six conceptual domains: coding accuracy, coding completeness, sequencing accuracy, compliance with coding standards, documentation quality, and claim impact. Each domain was operationally defined and used as the basis for generating measurable audit indicators.

Audit indicators were developed through iterative discussions within the research team to ensure conceptual relevance, practical applicability, and consistency with coding standards and Indonesian guidelines. Each indicator was supported by an operational definition and assessment criteria to facilitate standardised interpretation. The preliminary version of IAMPK comprised 31 indicators distributed across the six domains and was subsequently evaluated in the first modified Delphi round.

The preliminary instrument used a three-response scoring system consisting of 1 (criterion met), 0 (criterion not met), and NA (not applicable). The inclusion of the NA category enabled auditors to distinguish between criteria that were not fulfilled and those that were not applicable to specific clinical situations, thereby improving the flexibility and applicability of the instrument across different healthcare settings. The overall instrument development process is summarised in Figure 1.

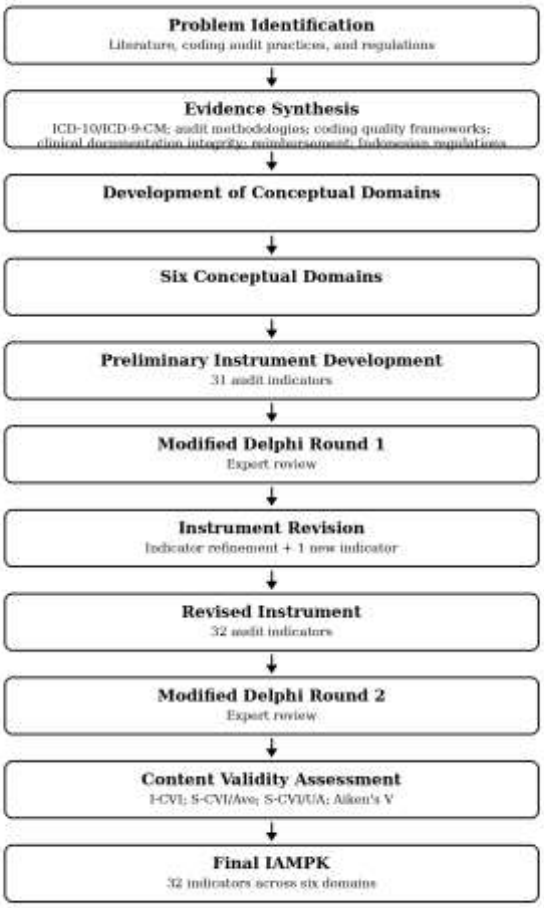


**Figure 1.** Development and content validation process of the Instrument for IAMPK

### 2.3 Expert Panel and Modified Delphi Process

The preliminary version of IAMPK was refined through a two-round modified Delphi process to establish expert consensus regarding the relevance, clarity, and representativeness of the audit indicators. A purposive sampling strategy was used to recruit seven experts with extensive experience in clinical coding, health information management, health information education, clinical documentation, and healthcare reimbursement. The multidisciplinary composition of the panel ensured that both academic and practical perspectives were represented throughout the instrument refinement process.

The preliminary instrument consisted of 31 audit indicators organised into six conceptual domains. During the first Delphi round, each expert independently evaluated every indicator using a four-point relevance scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant, and 4 = highly relevant). Experts were also invited to provide qualitative comments regarding indicator wording, operational definitions, completeness, clarity, and practical applicability.

Following completion of the first Delphi round, the research team reviewed all quantitative ratings together with the qualitative feedback. The expert recommendations resulted in revisions to several indicators, refinement of operational definitions, and improvements to the consistency of the instrument with international coding standards and Indonesian coding guidelines. The review process also identified one conceptual aspect that was insufficiently represented in the preliminary instrument. Accordingly, one additional audit indicator was developed to improve the comprehensiveness of the instrument, resulting in a revised version comprising 32 audit indicators.

The revised instrument was subsequently redistributed to the same panel of experts for a second Delphi round. During this round, experts reassessed the relevance and clarity of all 32 indicators to determine whether consensus had been achieved following the revisions. The final ratings obtained from the second Delphi round were used for the quantitative content validity analysis and to establish the final version of the Instrument for IAMPK. Consensus was considered to have been achieved when all indicators met the predefined content validity criteria following the second Delphi round.

### 2.4 Content Validity Assessment

Content validity was assessed through item-level and scale-level content validity indices. The Item Content Validity Index (I-CVI) was derived for each indicator, reflecting the proportion of experts giving relevance ratings of 3 or 4 on a four-point scale. The Scale Content Validity Index/Average (S-CVI/Ave) was the average of all I-CVI values, while the Scale Content Validity Index/Universal Agreement (S-CVI/UA) indicated the percentage of indicators achieving universal expert consensus. Additionally, Aiken's V coefficient was computed for each indicator, providing a measure of expert agreement on the relevance of indicators, factoring in the ordinal scale nature. The integration of I-CVI, S-CVI/Ave, S-CVI/UA, and Aiken's V enabled a thorough assessment of the content validity of IAMPK. Indicators were deemed acceptable when they aligned with the recommended standards for content validity in instrument development.

The interpretation of I-CVI and S-CVI followed the recommendations of Lynn (1986) and Lynn (1986), Polit and Beck (2006), and Polit et al. (2007), whereas Aiken's V was interpreted according to the original approach proposed by Aiken (1985). The final version of IAMPK was established after all indicators satisfied the predefined content validity criteria following the second Delphi round.

### 2.5 Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of [Institution Name] (Approval No: 019/KEPK-STIKes MHK/EC-D/IV/2026,). All expert panel members provided informed consent before participating in the modified Delphi process. Clinical records used during instrument development and pilot testing were anonymised before analysis to ensure patient confidentiality. All study procedures were conducted in accordance with the ethical principles for health research.

## 3. RESULTS

### 3.1 Development of IAMPK

The development process of the Instrument for IAMPK is illustrated in Figure 1. Evidence synthesis from international coding standards, published coding audit methodologies, coding quality indicator frameworks, clinical documentation integrity literature, reimbursement-related references, and Indonesian coding regulations informed the development of the instrument. The contribution of each evidence source is presented in Table 1.

The evidence synthesis resulted in the identification of six conceptual domains representing clinical coding quality: coding accuracy, coding completeness, sequencing accuracy, compliance with coding standards, documentation quality, and claim impact. These domains provided the conceptual basis for developing the preliminary version of IAMPK.

A preliminary instrument consisting of 31 audit indicators was developed and subsequently evaluated during the first round of the modified Delphi process. Based on expert feedback, several indicators were refined and one additional indicator was incorporated to improve the comprehensiveness of the instrument. Consequently, the revised instrument consisted of 32 audit indicators, which were further evaluated in the second Delphi round to establish the final version of IAMPK.

### 3.2 Characteristics of the Expert Panel

The expert panel comprised seven professionals with complementary expertise in health information management, clinical coding, casemix, and healthcare quality assurance (Table 2). Three experts were clinical coding practitioners, two were health information management academics, one was a clinical coding practitioner with expertise in casemix, and one specialised in quality assurance and clinical coding. The panel represented a balance between academic and professional perspectives relevant to clinical coding quality.

The educational qualifications of the panel included one bachelor's degree, four master's degrees, and two doctoral degrees. The experts had substantial professional experience, with a mean of 12.7 ± 5.5 years (range: 7–20 years), supporting the credibility of the consensus process.

**Table 2.** Characteristics of the Expert Panel (n = 7)

| Characteristic | n (%) |
|---|---|
| Professional background | |
| Health Information Management academic | 2 (28.6) |
| Clinical coding practitioner | 3 (42.9) |
| Clinical coding practitioner and casemix expert | 1 (14.3) |
| Quality assurance and clinical coding practitioner | 1 (14.3) |
| Highest educational qualification | |
| Bachelor's degree (S1) | 1 (14.3) |
| Master's degree (S2) | 4 (57.1) |
| Doctoral degree (S3) | 2 (28.6) |
| Professional experience (years) | |
| Mean ± SD | **12.7 ± 5.5** |
| Range | **7–20** |

### 3.3 Modified Delphi Findings

The preliminary version of IAMPK consisted of 31 audit indicators distributed across six conceptual domains and was evaluated by seven experts during the first round of the modified Delphi process. Experts provided quantitative ratings together with qualitative comments regarding indicator relevance, clarity, operational definitions, and practical applicability.

Based on the feedback obtained during the first Delphi round, several indicators were revised to improve wording and consistency with international coding standards and Indonesian coding guidelines. In addition, one new audit indicator was developed to address a conceptual aspect that had not been adequately represented in the preliminary instrument. Consequently, the revised instrument comprised 32 audit indicators.

The revised instrument was subsequently evaluated during the second Delphi round by the same expert panel. Following the second round, consensus was achieved for all indicators, and the final version of IAMPK consisting of 32 audit indicators was established.

### 3.4 Content Validity of IAMPK

The content validity assessment of the developed instrument, referred to as IAMPK, showcased its excellent content validity through various metrics. The final version comprises 32 audit indicators, each achieving a perfect Item Content Validity Index (I-CVI) of 1.00, signifying unanimous agreement on their relevance, as presented in Table 3. At the scale level, the instrument also displayed exemplary content validity with a Scale Content Validity Index/Average (S-CVI/Ave) of 1.00 and a Scale Content Validity Index/Universal Agreement (S-CVI/UA) of 1.00. Additionally, Aiken's V coefficients for the indicators ranged from 0.86 to 1.00, indicating levels of agreement that vary from acceptable to excellent. These comprehensive findings collectively

affirm that the final version of IAMPK not only possesses excellent content validity but also effectively captures the multidimensional nature of clinical coding quality.

**Table 3.** Content Validity Results of the Instrument for IAMPK

| Measure | Result |
|---|---|
| Number of experts | 7 |
| Number of indicators | 32 |
| I-CVI | 1.00 |
| S-CVI/Ave | 1.00 |
| S-CVI/UA | 1.00 |
| Aiken's V | 0.86–1.00 |

### 3.5 Final Instrument

Following the modified Delphi process and content validity assessment, the final version of the Instrument for IAMPK was developed, consisting of 32 audit indicators categorized into six conceptual domains. These domains encompass coding accuracy, coding completeness, sequencing accuracy, adherence to coding standards, documentation quality, and claim impact, illustrating the multifaceted aspects of clinical coding quality. The comprehensive structure of the final instrument, including the specifics of each indicator and domain focus, is detailed in Table 4.

**Table 4.** Final Structure of the Instrument for IAMPK

| Domain | Number of indicators | Description |
|---|---|---|
| Coding accuracy | 8 | Accuracy of diagnosis and procedure code assignment |
| Coding completeness | 5 | Completeness of diagnosis and procedure coding |
| Sequencing accuracy | 4 | Correct sequencing of diagnosis and procedure codes |
| Compliance with coding standards | 6 | Compliance with ICD coding standards and national coding guidelines |
| Documentation quality | 5 | Adequacy of clinical documentation supporting code assignment |
| Claim impact | 4 | Potential influence of coding quality on INA-CBG claim reimbursement |
| **Total** | **32** | — |

Each indicator was accompanied by clearly defined operational criteria and a standardized scoring system to ensure consistent application during clinical coding audits. The instrument facilitates systematic evaluation of coding quality across various aspects while accommodating situation-specific indicators through a Not Applicable (NA) category. The final IAMPK offers a comprehensive framework for IAMPK, establishing a standardized tool that supports quality improvement initiatives, professional auditing activities, and future validation studies in health information management.

## 4. DISCUSSION

This study developed and established the content validity of the IAMPK through a rigorous instrument development process incorporating evidence synthesis and a two-round modified Delphi technique. The resulting instrument comprises 32 audit

indicators that collectively provide a structured and multidimensional framework for evaluating clinical coding quality. The excellent content validity achieved through expert consensus indicates that the instrument adequately represents the essential dimensions required for clinical coding quality assessment. This finding is important because high-quality clinical coding underpins the integrity of health information, supporting clinical decision-making, quality improvement, health service planning, reimbursement systems, and health research. As healthcare systems increasingly rely on accurate and reliable health data, the availability of a standardised and evidence-based audit instrument may facilitate more consistent evaluation and improvement of clinical coding quality across healthcare settings (Shepheard, 2020; Davis and Shepheard, 2024).

Clinical coding quality is increasingly recognised as a multidimensional construct that extends beyond coding accuracy alone. Although coding accuracy remains a fundamental indicator of coding performance, high-quality clinical coding also depends on complete code assignment, correct sequencing of diagnoses and procedures, compliance with coding standards, comprehensive clinical documentation, and an understanding of the downstream effects of coding on reimbursement and health information quality. These dimensions are closely interconnected and collectively determine the integrity, reliability, and secondary use of health data for patient care, quality improvement, health service planning, research, and funding decisions (Shepheard, 2020). Furthermore, recent evidence has highlighted that clinical documentation integrity is a prerequisite for accurate clinical coding, as incomplete or ambiguous documentation contributes to coding errors, compromises data quality, and may adversely affect patient safety and healthcare outcomes (Davis and Shepheard, 2024). Consistent with these perspectives, qualitative evidence from health information managers also indicates that incomplete clinical documentation, limited communication between clinicians and coders, and organisational constraints remain major barriers to achieving high-quality clinical coding, emphasising the need for comprehensive audit approaches rather than evaluations limited to coding accuracy alone (Doktorchik et al., 2020). These findings provide a strong conceptual justification for the development of IAMPK, which integrates six complementary domains into a single audit framework to support a more comprehensive evaluation of clinical coding quality.

The excellent content validity demonstrated by IAMPK reflects the robustness of the instrument development process rather than expert agreement alone. The systematic integration of evidence from international coding standards, clinical coding audit frameworks, clinical documentation integrity literature, and Indonesian coding regulations ensured that the preliminary indicators comprehensively represented the construct of clinical coding quality. This evidence-based approach was further strengthened through two rounds of the modified Delphi technique, which enabled iterative refinement of indicator wording, clarification of operational definitions, and incorporation of expert recommendations before achieving consensus. Methodological studies have consistently shown that rigorous instrument development, beginning with comprehensive evidence synthesis and followed by structured expert evaluation, enhances the relevance, clarity, and representativeness of instrument content (Boateng et al., 2018; DeVellis and Thorpe, 2021). Similarly, the modified Delphi technique has been widely recognised as an appropriate approach for developing consensus-based instruments in healthcare because it facilitates systematic refinement while reducing the influence of individual opinions (Hasson et al., 2000; Keeney et al., 2011). Therefore, the findings of this study suggest that the high content validity of IAMPK reflects the methodological rigour applied throughout the instrument development process. High content validity also provides an important foundation for subsequent psychometric evaluations, including reliability testing and construct validation, before broader implementation in diverse healthcare settings (Polit & Beck, 2006; Boateng et al., 2018).

Existing literature has consistently highlighted the importance of clinical coding audits in ensuring the quality and integrity of health information. However, previous studies have generally focused on specific aspects of coding performance, such as coding accuracy, adherence to coding standards, or clinical documentation, rather than providing a comprehensive framework that integrates these interrelated dimensions (Shepheard, 2020; Davis and Shepheard, 2024). The development of IAMPK addresses this gap by bringing together six complementary domains into a single audit instrument, allowing clinical coding quality to be evaluated from technical, documentation, compliance, and reimbursement perspectives. This integrated framework reflects the complex nature of contemporary clinical coding practice, where coding quality is influenced by multiple interconnected factors rather than a single performance indicator. Furthermore, by combining internationally recognised coding principles with the Indonesian coding and reimbursement context, IAMPK offers a contextually relevant yet internationally informed framework that may support standardised clinical coding audits, quality improvement initiatives, and future research in health information management.

Beyond its methodological contribution, IAMPK has important practical implications for health information management practice. A structured and standardised audit instrument can support healthcare organisations in conducting systematic evaluations of clinical coding quality and identifying priority areas for quality improvement. This is particularly important because high-quality clinical coding contributes not only to accurate reimbursement but also to the integrity of health information, healthcare performance measurement, and informed clinical and managerial decision-making (Shepheard, 2020). Furthermore, the growing emphasis on clinical documentation integrity and organisational factors influencing coding practice highlights the need for audit approaches that evaluate coding quality within the broader context of documentation quality, compliance with coding standards, and organisational coding processes rather than focusing solely on coding accuracy (Davis and Shepheard, 2024; Doktorchik et al., 2020). By integrating these complementary dimensions into a single framework, IAMPK provides coding auditors and health information management professionals with a practical tool for conducting more comprehensive coding quality audits. The instrument may also support professional education, competency development, and future psychometric evaluation and implementation studies across diverse healthcare settings.

This study has several strengths. The development of IAMPK followed a rigorous and systematic instrument development process involving evidence synthesis, expert consensus through a two-round modified Delphi technique, and quantitative evaluation of content validity using established methodological standards (Boateng et al., 2018; DeVellis and Thorpe, 2021). Another important strength is the integration of internationally recognised clinical coding principles with the Indonesian clinical coding and reimbursement context, enhancing the instrument's contextual relevance while maintaining alignment with international practice. The involvement of experts from diverse professional backgrounds further strengthened the comprehensiveness and content relevance of the instrument. Nevertheless, several limitations should be acknowledged. This study evaluated only content validity and did not examine other psychometric properties, including construct validity, criterion validity, inter-rater reliability, and test–retest reliability. Furthermore, the instrument has not yet been implemented or evaluated across different types of healthcare facilities, which may limit its generalisability. These limitations provide a foundation for future validation and implementation studies to further establish the robustness and applicability of IAMPK in diverse healthcare settings.

Future research should focus on further establishing the psychometric robustness and practical applicability of IAMPK through successive stages of instrument evaluation (Boateng et al., 2018; DeVellis and Thorpe, 2021). Subsequent studies should evaluate additional measurement properties, including construct validity, criterion validity, and reliability, to ensure that the instrument performs consistently across different users, patient populations, and healthcare settings. Furthermore, multicentre implementation studies are needed to examine the feasibility, acceptability, and usability of IAMPK as a routine clinical coding audit instrument in real-world practice. Evidence generated from these studies will support further refinement of the instrument and provide a stronger empirical foundation for its broader adoption in health information management. Ultimately, continuous validation and implementation of IAMPK may contribute to more standardised clinical coding audit practices and support ongoing quality improvement initiatives in healthcare organisations.

## 5. CONCLUSION

This study developed IAMPK, a multidimensional instrument for IAMPK comprising 32 indicators across six complementary domains. Developed through a rigorous and systematic process, the instrument demonstrated excellent content validity and provides a comprehensive framework for evaluating clinical coding quality beyond coding accuracy alone. By integrating technical, documentation, compliance, and claim-related dimensions, IAMPK offers a standardised approach to support clinical coding audits and quality improvement in health information management. Although further psychometric testing and implementation studies are required, the instrument provides a strong foundation for strengthening the consistency and quality of clinical coding audit practices across diverse healthcare settings.

## REFERENCES

[1] Aiken LR (1985) Three coefficients for analyzing the reliability and validity of ratings. Educational and Psychological Measurement 45(1): 131–142. DOI: 10.1177/0013164485451012.

[2] Alonso V, Santos JV, Pinto M, Ferreira J, Lema I, Lopes F and Freitas A (2020) Health records as the basis of clinical coding: Is the quality adequate? A qualitative study of medical coders' perceptions. Health Information Management Journal 49(1): 28–37. DOI: 10.1177/1833358319826351.

[3] Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR and Young SL (2018) Best practices for developing and validating scales for health, social, and behavioral research: A primer. Frontiers in Public Health 6: 149. DOI: 10.3389/fpubh.2018.00149.
[4] Campbell S and Giadresco K (2020) Computer-assisted clinical coding: A narrative review of the literature on its benefits, limitations, implementation and impact on clinical coding professionals. Health Information Management Journal 49(1): 5–18. DOI: 10.1177/1833358319851305.
[5] Centers for Medicare & Medicaid Services (CMS) (n.d.) ICD-9-CM Diagnosis and Procedure Codes: Abbreviated and Full Code Titles. Baltimore, MD: CMS.
[6] Davis J and Shepheard J (2024) Clinical documentation integrity: Its role in health data integrity, patient safety and quality outcomes and its impact on clinical coding and health information management. Health Information Management Journal 53(2): 53–60. DOI: 10.1177/18333583231218029.
[7] DeVellis RF and Thorpe CT (2021) Scale Development: Theory and Applications. 5th ed. Thousand Oaks, CA: SAGE Publications.
[8] Doktorchik C, Lu M, Quan H, Ringham C and Eastwood C (2020) A qualitative evaluation of clinically coded data quality from health information manager perspectives. Health Information Management Journal 49(1): 19–27. DOI: 10.1177/1833358319855031.
[9] Hasson F, Keeney S and McKenna H (2000) Research guidelines for the Delphi survey technique. Journal of Advanced Nursing 32(4): 1008–1015. DOI: 10.1046/j.1365-2648.2000.t01-1-01567.x.
[10] Hay P, Wilton K, Barker J, Mortley J and Cumerlato M (2020) The importance of clinical documentation improvement for Australian hospitals. Health Information Management Journal 49(1): 69–73. DOI: 10.1177/1833358319854185.
[11] Keeney S, McKenna H and Hasson F (2011) The Delphi Technique in Nursing and Health Research. Chichester: Wiley-Blackwell. DOI: 10.1002/9781444392029.
[12] Lam MK, Innes K, Saad P, Rust J, Dimitropoulos V and Cumerlato M (2008) An evaluation of the quality of obstetric morbidity coding using an objective assessment tool, the Performance Indicators for Coding Quality (PICQ). Health Information Management Journal 37(2): 19–29. DOI: 10.1177/183335830803700203.
[13] Lynn MR (1986) Determination and quantification of content validity. Nursing Research 35(6): 382–386. DOI: 10.1097/00006199-198611000-00017.
[14] Ministry of Health of the Republic of Indonesia (2021) Regulation of the Minister of Health of the Republic of Indonesia Number 26 of 2021 concerning Guidelines for Indonesian Case Base Groups (INA-CBG) in the Implementation of Health Insurance. Jakarta: Ministry of Health of the Republic of Indonesia.
[15] National Centre for Classification in Health (2001) Australian Coding Benchmark Audit (ACBA). 2nd ed. Lidcombe, NSW: National Centre for Classification in Health.
[16] Polit DF and Beck CT (2006) The content validity index: Are you sure you know what's being reported? Critique and recommendations. Research in Nursing & Health 29(5): 489–497. DOI: 10.1002/nur.20147.
[17] Polit DF, Beck CT and Owen SV (2007) Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Research in Nursing & Health 30(4): 459–467. DOI: 10.1002/nur.20199.
[18] Shepheard J (2020) Clinical coding and the quality and integrity of health data. Health Information Management Journal 49(1): 3–4. DOI: 10.1177/1833358319874008.
[19] World Health Organization (2016) International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), Volume 2: Instruction Manual. 5th ed. Geneva: World Health Organization.
[20] World Health Organization (2022) International Classification of Diseases, Eleventh Revision (ICD-11): Reference Guide. Geneva: World Health Organization.