Original Article

International Classification of Primary Care-2 coding of primary care data at the general out-patients' clinic of General Hospital, Lagos, Nigeria

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Abstract

Background: Primary care serves as an integral part of the health systems of nations especially the African continent. It is the portal of entry for nearly all patients into the health care system. Paucity of accurate data for health statistics remains a challenge in the most parts of Africa because of inadequate technical manpower and infrastructure. Inadequate quality of data systems contributes to inaccurate data. A simple-to-use classification system such as the International Classification of Primary Care (ICPC) may be a solution to this problem at the primary care level. **Objectives:** To apply ICPC-2 for secondary coding of reasons for encounter (RfE), problems managed and processes of care in a Nigerian primary care setting. Furthermore, to analyze the value of selected presented symptoms as predictors of the most common diagnoses encountered in the study setting. **Materials and Methods:** Content analysis of randomly selected patients' paper records for data collection at the end of clinic sessions conducted by family physicians at the general out-patients' clinics. Contents of clinical consultations were secondarily coded with the ICPC-2 and recorded into excel spreadsheets with fields for sociodemographic data such as age, sex, occupation, religion, and ICPC elements of an encounter: RfE/complaints, diagnoses/problems, and interventions/processes of care. **Results:** Four hundred and one encounters considered in this study yielded 915 RfEs, 546 diagnoses, and 1221 processes. This implies an average of 2.3 RfE, 1.4 diagnoses, and 3.0 processes per encounter. The top 10 RfE, diagnoses/common illnesses, and processes were determined. Through the determination of the probability of the occurrence of certain diseases beginning with a RfE/complaint, the top five diagnoses that resulted from each of the top five RfE were also obtained. The top five RfE were: headache, fever, pain general/multiple sites, visual disturbance other and abdominal pain/cramps general. The top five diagnoses were: Malaria, hypertension uncomplicated, visual disturbance other, peptic ulcer, and upper respiratory infection. From the determination of the posterior probability given the top five RfE, malaria, hypertension, upper respiratory infection, refractive error, and conjuctivitis were the five most frequent diagnoses that resulted from a complaint of a headache. **Conclusion:** The study demonstrated that ICPC-2 can be applied to primary care data in the Nigerian context to generate information about morbidity and services provided. It also provided an empirical basis to support diagnosis and prognostication in a primary care setting. In developing countries where the transition to electronic health records is still evolving and fraught with limitations, more reliable data collection can be achieved from paper records through the application of the ICPC-2.

Keywords: Diagnosis, International Classification of Primary Care-2, outpatient health services, primary health care, probability, reasons for encounter

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Introduction

The government of Nigeria and those of many other countries became very interested in the primary health care delivery system after the Alma-Ata conference, but its principles and ideologies have become difficult for many developing countries to actualize.[1] The Nigerian government is however committed to quality and accessible public health services through the provision of primary health care as well as the provision of preventive and curative services (Nigerian Constitution, 1999).

Primary care has been defined as the provision of integrated accessible health care services by family physicians/general practitioners who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community.[2] It is a hub from which patients are guided through the health system. Primary care has been described with reference to physicians with a specialization in family medicine or general practice, in well-resourced contexts.[3,4]

Health care provision in Nigeria is a concurrent responsibility of the three tiers of government in the country (federal, state, and local). The Lagos state government in a bid to revitalize primary health care to optimal standards of performance across the state has identified poor data management as being among the numerous challenges facing successful implementation of primary health care in Nigeria.[5] Specifically, there is a lack of a primary care classification tool and by extension, little or no training of health information managers to work with such.

Although most people in Nigeria/Africa are treated at the primary care level, there is little empirical information about what family physicians and other professionals encounter on a day to day basis.[6,7] This impedes the development of primary health care as the core of health care. The importance of empirical data for the development of primary care cannot be over-emphasized. It provides an instrument for priority setting and for improving the processes of management and care.[8] Epidemiological data obtained at this level is an invaluable source of health information for planning and policy formulation.

Very few published work exist about primary health care data systems in Africa.[6,7] Furthermore, the application of the International Classification of Primary Care, second edition (ICPC-2) to patients' medical records in primary care is very low in the African region.[6]

Primary care information systems offer enormous opportunities to monitor the impact of changes in lifestyle and advances in medicine and social conditions, and to quantify the quality of care.[9] Notable and commendable are the examples of Australia's ICPC-2 encounter-based continuous collection of general practice data[10] and The Netherlands, where systematic collection and analysis of data from the Registration Network of Family Practices and the ICPC-2-based Transition Project opens the way to a primary domain of knowledge.[9,11] Such systematic collections from electronic health records are yet to be established at the primary care level in Nigeria. Limitations include inadequate technical manpower and infrastructure[5] including the lack of an appropriate coding system for primary care purposes.

It is important to emphasize that primary health care operates in the local context. It is, therefore, necessary to constantly analyze data from within this context as data from the secondary, and tertiary contexts may not reflect the Nigerian primary care situation.

This makes it a priority to collect data from hands-on Nigerian primary care. The practice-level dataset utilized in this study represents a beginning on which to build a process that could produce a reliable database which will be targeted at unlocking the domain of primary care in Lagos, Nigeria. A pertinent question in developing this database is in the choice of the most appropriate methodology to standardize the categorization of data. Based on international experience, a choice has been made for the ICPC.[11-13] The ICPC-2 is used in more than 45 countries as the standard for data classification in primary care. It is accepted by the WHO in the WHO Family of International Classifications[14] and it is an excellent epidemiological tool.

The ICPC which was first published in 1987[15] (Oxford University press) has now been available to the family medicine community for nearly three decades as the main ordering principle of its domain. The ICPC-2 is the revised version published in 1998. As opposed to the International Statistical Classification of Diseases, Injuries and Causes of Deaths (ICD), the ICPC was especially developed for primary care purposes.

The ICPC-2 has a bi-axial structure: 17 chapters on one axis, each with an alpha code, and seven identical components with rubrics bearing a two-digit numeric code as the second axis. The chapters are constructed for the organ systems, for psychological and social problems and one general chapter. ICPC has a significant mnemonic quality which facilitates its day-to-day use in primary care and simplifies the centralized manual coding of data recorded elsewhere. Each rubric has a three digit code number, a title of limited length, and the codes of the corresponding ICD-10 rubrics. Most rubrics also have inclusion terms, exclusion terms, and "consider" terms.[16] It also has the advantage of being related and linked to ICD-10 and offers the benefit of hierarchical expansion when necessary, thus making it ideal for primary care.

The data structure of this study is based on the concept of the elements of an encounter. An encounter which is the professional interchange between a patient and a family physician, in ICPC is made up of three elements: Reasons for encounter (RfE)/complaints, diagnoses/problems and interventions/processes/procedures. The RfE reflects the patients' views, concerns, symptoms/complaints/requests, i.e., their reasons for seeking care (not the immediate assumptions or beliefs of their doctors).[13]

From this study, the importance of ICPC-2 coding for primary care data management towards the development of primary health care in Nigeria will be demonstrated using paper records. This paper presents the first experiences with ICPC-2, addressing the question "using ICPC-2, what are the morbidity and service delivery patterns in a Nigerian primary care setting?"

Materials and Methods

Ethics: Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos State University Teaching Hospital. Reference number: LREC/10/06/442; Date: June 17, 2014.

The data structure of this study is based on the concept of the elements of an encounter.

Study design

It was a descriptive study that was conducted at the general out-patients' clinic of the family medicine department of the premier general hospital in Nigeria; where both primary and secondary level health care services are rendered. The general out-patients' clinic is run mainly by family physicians who are knowledgeable about ICPC-2 elements of an encounter.

Sample size estimation/sampling technique/study protocol

Content analysis was carried out on a sample of 401 encounters that was randomly selected by systematic sampling until the minimum sample size of 384 (being the minimum number of patient encounters to which ICPC-2 can be applied for secondary coding) was exceeded. The minimum sample size was determined from the formula developed by Cochran[17,18] to yield a representative sample for proportions from qualitative data for populations that are large. The sampling interval (25) was determined as the ratio of the average estimated population size over the 3-month study period (9600) and the minimum sample size (384). There was no hidden pattern to the arrangement of the patients' cards.

Secondary coding of the elements of an encounter was done by two of the investigators, one primary coder and a second coder who double checked the data. Both were certified to use the two pager of the ICPC-2.[19] The accuracy of coding was ensured with the aid of the ICPC2-ICD10 thesaurus.[20]

Data were recorded into excel spreadsheets with fields for sociodemographic data such as age, sex, occupation, religion, and ICPC elements of an encounter: RfE/complaints, diagnoses/problems, and interventions/processes of care.

Data analysis

Data were analyzed using the computer program Epi Info(EPI) info 7 software (CDC Atlanta, Georgia, USA, EPI info 7 version 7.0.8.0). Descriptive statistics (frequency distribution) and probability estimations were employed.

Results

A total of 401 encounters considered in this study yielded 915 RfEs, 546 diagnoses, and 1221 processes. This implies an average of 2.3 RfE, 1.4 Diagnoses, and 3.0 Processes per encounter/visit. Females accounted for 54.9% of encounters with a male to female ratio of 1:1.2. The average age of the patients was 39 years 11 months (standard deviation [SD]=16.74).

Distribution of the elements of an encounter

Table 1 shows the top 10 RfE and top 10 diagnoses in this study arranged in descending order of frequency.

Headache, fever, pain general/multiple sites, visual disturbance, and abdominal pain/cramps general were the top five RfE. These accounted for 30.6% of all RfE in this study, with an average of 2.3 RfE per encounter.

Malaria, hypertension uncomplicated, visual disturbance, peptic ulcer, and upper respiratory infection were the most common diagnoses. They accounted for 30.8% of all problems/diagnoses, with an average of 1.4 diagnoses per encounter.

Table 1: Top 10 reasons for encounter and top 10 diagnoses

	RfE	Frequency	Percentage of encounters (*n*=401)	Diagnosis	Frequency	Percentage of encounters (*n*=401)
1	N01 - Headache	75	18.7	A73 - Malaria	72	18.0
2	A03 - Fever	69	17.2	K86 - Hypertension uncomplicated	47	11.7
3	A01 - Pain general/multiple sites	52	13.0	F05 - Visual disturbance other	22	5.5
4	F05 - Visual disturbance other	47	11.7	D86 - Peptic ulcer	14	3.5
5	D01 - Abdominal pain/cramps general	37	9.2	R74 - Upper respiratory infection acute	13	3.2
6	R05 - Cough	33	8.2	K87 - Hypertension complicated	11	2.7
7	K86 - Hypertension uncomplicated	25	6.2	U71 - Cystitis	11	2.7
8	S04 - Lump/swelling localized	23	5.7	A99 - General diseases not elsewhere specified	11	2.7
9	L03 - Low back symptom/complaint	21	5.2	F70 - Conjunctivitis infectious	9	2.2
10	N06 - Sensation disturbance other	19	4.7	F91 - Refractive error	9	2.2

RfE: Reasons for encounter

The most common RfE were from the following chapters (representing body systems/problem areas): General and unspecified (22.1%), eye (12.5%), neurological (11.9%), digestive (8.7%), musculoskeletal (8.7%), respiratory (7.3%), cardiovascular (6.9%), skin (5.5%), female genital (4.8%), and urological (3.5%), as shown in Figure 1.

The most common diagnoses were from the following chapters: General and unspecified (18.7%), eye (13.7%), cardiovascular (13.0%), musculoskeletal (9.5%). Digestive (9.3%), respiratory (6.6%), female genital (6.6%), skin (6.0%), urological (4.0%), and endocrine and nutritional (3.3%), as shown in Figure 2.

In this study, 64.2% of the 500 rubrics for coding patients' complaints and doctors' diagnoses were utilized. The usage of rag bags was 22.1%, mainly from the chapters of general and unspecified problems (34.8%), skin problems (17.4%), eye problems (11.6%), cardiovascular problems (10.1%), and musculoskeletal problems (7.2%).

Table 2 shows the top 10 processes (diagnostic and therapeutic procedures) from the encounters in the study arranged in descending order of frequency with the top 5 being: Medical examination partial, medication-script/inject, referral to specialist, blood test, and diagnostic radiology. These top five processes of care accounted for 88.6% of all processes/interventions in this study.

Most referrals were on account of eye problems (21.8%), general and unspecified problems (17.3%), cardiovascular problems (14.0%), skin problems (8.4%), and digestive problems (5.6%).

Of diagnostic tests, 187 laboratory investigations were carried out. They were: Blood tests (31.67% of all encounters), urine tests (9.73% of all encounters), and microbiological/immunological tests (5.24%). The average number of laboratory tests per encounter was 0.47. Sixty-five radiographs and 27 electrocardiographs (ECG) were requested from the encounters in this study. The average number of radiographs and ECG per encounter was 0.16 and 0.07 respectively.

Three hundred and forty-four prescriptions were generated at an average of 0.86 per encounter.

Table 3 displays the probability of the occurrence of certain diseases given the presence of a RfE/complaint. The first five diagnoses resulting from each of the first five RfE accounted for about 60% of all diagnoses arising from this complaints/RfE. Malaria (39.3%), hypertension (11.2%), and upper respiratory infection (4.7%) were the most frequent diagnoses that resulted from a complaint of headache. Abdominal pain often resulted in the diagnosis of peptic ulcer or cystitis (15.2% each) and starting with a complaint of cough, upper respiratory infection was most often the resultant diagnosis.

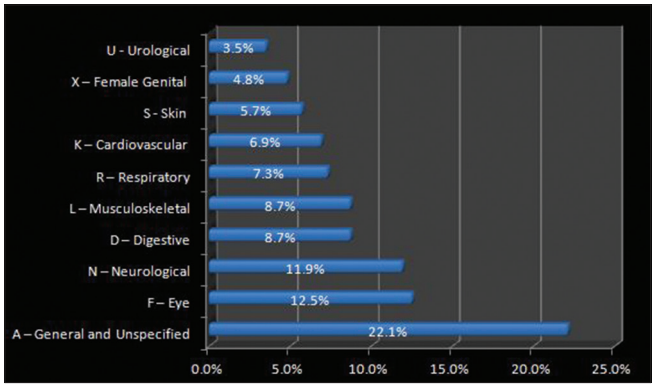

Figure 1: Top 10 chapters by reasons for encounter

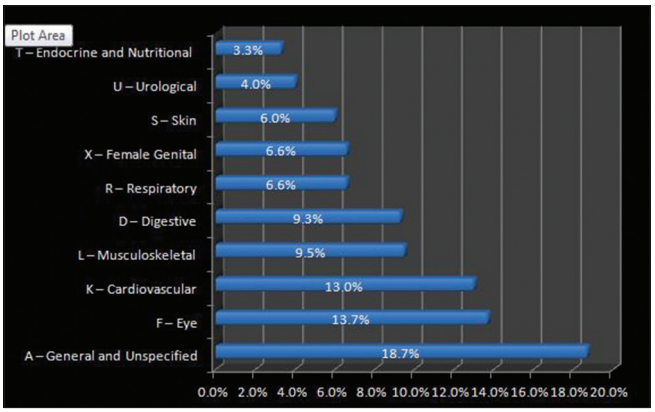

Figure 2: Top 10 chapters by diagnosis

Table 2: Top 10 processes/procedures/interventions

Process code	Frequency	Percentage of encounters (*n*=401)	Percentage of diagnoses (*n*=546)	Percentage of total processes (*n*=1221)
31 - Medical examination partial	381	95.01	69.78	31.2
50 - Medication-script/inject	344	85.79	63.00	28.2
67 - Referral to specialist	157	39.15	28.75	12.9
34 - Blood test	127	31.67	23.26	10.4
41 - Diagnostic radiology	65	16.21	11.90	5.3
35 - Urine test	39	9.73	7.14	3.2
45 - Observe/educate	29	7.23	5.31	2.4
42 - Electrical tracings	27	6.73	4.95	2.2
66 - Refer to other provider (physiotherapist, dietician)	22	5.49	4.03	1.8
33 - Microbiological/immunological test	21	5.24	3.85	1.7

Table 3: Top five diagnoses resulting from each of the top five reasons for encounter

	Frequency	Percentage within RfE group %
RfE N01 (headache)		
A73 - Malaria	42	39.3
K86 - Hypertension uncomplicated	12	11.2
R74 - URI	5	4.7
F91 - Refractive error	3	2.8
F70 - Conjunctivitis	2	1.9
Others	43	40.2
Total	107	100
RfE A03 (fever)		
A73 - Malaria	45	48.9
R74 - URI	5	5.4
D70 - Gastrointestinal infection	2	2.2
R05 - Cough	2	2.2
U71 - Cystitis	2	2.2
Others	36	39.1
Total	92	100
RfE A01 (pain general/multiple sites)		
A73 - Malaria	39	53.4
R74 - URI	3	4.1
L99 - Musculoskeletal disease other	2	2.7
D70 - Gastrointestinal infection	1	1.4
L18- Muscle pain	1	1.4
Others	27	37.1
Total	73	100
RfE F05 (visual disturbance)		
F05 - Visual disturbance	21	29.2
F91 - Refractive error	9	12.5
A73 - Malaria	6	8.3
K86 - Hypertension	6	8.3
F70 - Conjunctivitis	4	5.6
Others	26	36.1
Total	72	100
RfE D01 (abdominal pain)		
D86 - Peptic ulcer	7	15.2
U71 - Cystitis	7	15.2
D01 - Abdominal pain	5	10.9
X74 - Pelvic inflammatory disease	3	6.5
U72 - Urethritis	2	4.3
Others	22	47.8
Total	46	100

URI: Upper respiratory infections; RfE: Reasons for encounter

Table 4 shows the conditional probabilities of some diagnoses given certain RfE. The probability of malaria given the presence of headache was 0.56 (56%), (sensitivity: 58.35%, specificity: 93%). In addition, fever had a positive predictive value (PPV) of 65.2% (sensitivity: 62.5%, specificity: 94.9%) while pain general/multiple sites had a PPV of 75% (sensitivity: 54.2%, specificity: 97.3%) respectively for a diagnosis of malaria. Visual disturbance had a PPV of 44.7% (sensitivity: 95.5%, specificity: 95%) for a symptomatic diagnosis of visual disturbance. The probabilities (negative predictive value [NPV]) of non-occurrence of some diagnoses given the absence of the top five RfE/complaints were shown to be very high (86.2–100%). The mean NPV was 0.969 (SD = 0.040).

Table 4: Conditional probabilities

RfE	Diagnosis	Sensitivity	Specificity	PPV	NPV
Headache	Malaria	0.583	0.930	0.560	0.936
	Hypertension uncomplicated	0.255	0.874	0.160	0.926
	URI	0.385	0.869	0.067	0.983
	Refractive error	0.333	0.866	0.040	0.987
	Conjunctivitis	0.222	0.864	0.027	0.985
Fever	Malaria	0.625	0.949	0.652	0.943
	URI	0.385	0.880	0.072	0.983
	Gastrointestinal infection	1.000	0.877	0.029	1.000
	Cough	0.400	0.876	0.029	0.993
	Cystitis	0.182	0.875	0.029	0.981
Pain general/ multiple sites	Malaria	0.542	0.973	0.750	0.933
	URI	0.231	0.908	0.058	0.980
	Musculoskeletal	0.400	0.908	0.038	0.994
	Gastrointestinal infection	0.500	0.906	0.019	0.998
	Muscle pain	0.333	0.906	0.019	0.996
Visual disturbance	Visual disturbance	0.955	0.950	0.447	0.998
	Refractive error	1.000	0.929	0.191	1.000
	Malaria	0.083	0.914	0.128	0.868
	Hypertension uncomplicated	0.128	0.918	0.128	0.918
	Conjunctivitis	0.444	0.920	0.085	0.990
Abdominal pain	Peptic ulcer	0.500	0.944	0.189	0.986
	Cystitis	0.636	0.944	0.189	0.992
	Abdominal pain	1.000	0.941	0.135	1.000
	Pelvic inflammatory disease	0.600	0.937	0.081	0.996
	Urethritis	0.667	0.934	0.054	0.862

PPV: Positive predictive value; NPV: Negative predictive value; RfE: Reasons for encounter; URI: Upper respiratory infections

The percentage accuracy of secondary coding was 91%, 94% and 87%, for RfE, diagnoses and processes of care, respectively.

Discussion

ICPC-2 was applied to the contents of patients' records in this study to classify the three elements of an encounter (clinical consultation) in the study setting.

The first five diagnoses resulting from each of the first five RfE accounted for about 60% of all encounters arising from these RfE. This is significant as it reflects the most frequently encountered problems in this primary care context. Such vital information will objectively guide health planners to focus on the most important problems affecting most of the people, most of the time.

Results from this study revealed a distribution of RfE predominantly in chapters: General and unspecified, eye, neurological, digestive, musculoskeletal, respiratory, cardiovascular, skin, female genital and urological. This is similar to the findings made by a group of researchers who defined pattern of illnesses using ICPC-2 in the West African sub-region in 2009.[6] General and unspecified problems,

neurological problems, problems related to the digestive system, musculoskeletal problems and skin problems featured in the top seven in both studies. A difference of more cases of pregnancy, child bearing, and family planning reported in the previous study and more cases of eye and cardiovascular problems reported in this study is possibly due to the difference in settings and the age distribution between the populations in both studies.

This study reveals differences in distribution of RfE and health problems when compared to ICPC-2 data collected in Europe (mainly The Netherlands, Malta and Serbia).[21] The most striking differences in the RfE were the high ranking of headache (first place in this present study and 10th place in Europe), general pain and visual disturbances which were not registered in the top 40 RfE in Europe. The differences between the diagnoses (malaria and peptic ulcer in the top 10 in this present study and at a very low position in Europe) supports the epidemiological variation in the different continents.[21] However, it is important to note that the durations of data collection differ between these studies. As a consequence the top 10 procedures are quite different; the high referral rate from primary care in this study is remarkable. The significant specialists' referral rate of 39.15% is a reflection of frequent eye presentations that required specialist review, for example, refractive errors, pterygium, cataract, and frequent symptom diagnosis of visual disturbance requiring further ophthalmic evaluation. The presence of a special tuberculosis unit designated for referral of all suspected and confirmed cases of tuberculosis, referral to the cardiologist, dermatological referrals, and referral to the gastroenterologist on account of increasing frequency of hepatitis B virus carrier state among other indications largely accounted for this rate.

The results emanating from this study give credence to the fact that ICPC-2 provides evidence about the activities on going at primary care level by classifying processes of care in addition to morbidity. Partial physical/medical examinations, laboratory, and other diagnostic tests such as radiologic and ECG tests were some of the most common processes. The therapeutic procedures most commonly performed include: Generation of medical prescriptions, referral to specialists and referral to other providers such as physiotherapist and dietician and rarely, patient education.

In ICPC, symptom diagnoses (e.g., insomnia, headache, tiredness) can be classified as such, without establishing a "higher" diagnosis.[22] This was demonstrated in the present study with visual disturbance being a frequent symptom diagnosis and an important indication for referral to the eye specialist.

ICPC-2 has residual rubrics (aka rag bags) in each chapter to classify rare symptoms/diseases. For example, S29-skin symptom/complaint other, F99-eye/adnexa disease other. These rubrics are based on data from Europe, Australia and America.

In this study, 64.2% of the 500 rubrics for coding patients' complaints and doctors' diagnoses were utilized. It suggests that ICPC-2 provided codes for the health problems frequently encountered in the study setting. Of this proportion, however, 22.1% were residual rubrics. The lack of specific rubrics for a few of the frequently encountered problems in the top five chapters, for example, hepatitis B carrier state (A99) and pterygium (F99), posed a bit of a challenge. However, the optional hierarchical expansion from ICPC-2 to ICD 10 which allows relevant codes from the ICD-10 to be incorporated into state or country specific adaptations of the ICPC-2 will be useful in addressing this problem in future and at a higher level of implementation.

Another area of challenge was the process codes which are broad and general, with the tendency for some overlaps in the coding of laboratory tests. Laboratory procedures as shown in Table 2 are classified on the basis of nature of specimen (blood test, urine test etc.) and purpose/type of test (sensitivity test, microbiological/immunological test etc.). The confusion that would have arisen from having more than one possible process code whenever blood specimen is taken for microbiological test was mitigated in this study by coding on the basis of nature of specimen (i.e., blood test rather than microbiological test). It is expected that the on-going ICPC-2 revision will address these issues regarding process codes.[16]

Limitations of the study

Assumptions from this study were based on the observed levels of accuracy for secondary coding derived from a single author, perhaps agreement scores (inter-coder reliability coefficient) should have been calculated between the authors.

Recommendations

Similar studies should be conducted in other Nigerian primary care settings so as to achieve a broader picture of the Nigerian primary care setting. Future studies may include comparisons between doctors and other staff using ICPC-2 for secondary coding of primary care data, they may also capture surrogate/experiential indices for measuring simplicity/complexity and comprehensiveness in applying ICPC-2 in Nigerian primary care settings.

Conclusion

The findings demonstrate that the ICPC-2 can be applied to categorize primary care data in the Nigerian context. They highlight the important advantage of ICPC-2 for classifying the three elements of a health care encounter all in a single classification.

This study is a necessary step in planning full development of a Lagos primary care database, using internationally approved codes, with the additional benefit of ensuring international comparability.

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Conflicts of interest

There are no conflicts of interest.

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