

Classifying Health Questions Asked by the Public Using the ICPC-2 Classification and a Taxonomy of Generic Clinical Questions: An Empirical Exploration of the Feasibility

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In case of an overload of information, structure is needed to make the content of the information accessible and the information flow well-ordered. If we wish to gain insight into the health information needs of the public, a specific research tool is needed. The aim of this study was to investigate the feasibility of using two professional classification structures for medical information to classify health questions asked by the public: one classification for the subject of the question, the International Classification of Primary Care (ICPC-2), and one classification for the nature and type of the question, the Taxonomy for Generic Clinical Questions (TGCQ). Health questions asked during online consultations with health care providers were retrieved (452 subjects for coding) and were given two codes: one code according to the ICPC-2 and one according to the TGCQ. The problems encountered during coding were recorded and analyzed. Nine different clusters of problems arose during classification with the ICPC-2, including issues regarding specificity, lay versus professional terminology, a combination of diverse complaints not complying with a clinical syndrome, and preclinical issues. Nine types of problems were encountered during the classification with the TGCQ: questions about preclinical issues, preventive procedures, name finding, health promotion, where to go for a diagnostic test or therapy, justification of the choice of a test or treatment, and common knowledge. The results of this study are promising, and further investigation of the validity, reliability, and use of these two classification systems to classify health questions asked by the public is desirable. The problems that were encountered should be solved before these professional systems can be used to classify the health information needs of the general public.

The public has become increasingly responsible for improving and maintaining personal health and the health of relatives. Relevant information is needed to make informed decisions regarding health. The amount of health information (e.g., on the Internet) available for the general public has increased exponentially (Cline & Haynes, 2001; Morahan-Martin,

2004). More information coincides with a higher complexity, and higher demands on the information-searching abilities needed to find the health information they require, leading to failed queries and a wide range of problems regarding information retrieval (Zeng, Kogan, Ash, Greenes, & Boxwala, 2002; Zeng et al., 2004).

The key for the success of public health communication is interaction between the sender and the receiver, i.e., exchanging information rather than simply transmitting information (Lee & Garvin, 2003; Van der Sanden &

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Meijman, 2008). Knowledge about the public's beliefs and questions they are having about health and disease is indispensable. A considerable number of studies have investigated the needs of the public with regard to health information, but these studies have focused on the needs of specific groups (e.g., parents of children with cancer; Rutten, Arora, Bakos, Aziz, & Rowland, 2005), or on priorities in the need for information by investigating search terms on the Internet, and not the actual needs (e.g., presenting a list of topics respondents can choose from; Eysenbach & Kohler, 2004).

A method is needed to systematically analyze and document these needs, e.g., a classification structure. Existing classification structures for health information are all constructed for professional use, such as the International Classification of Primary Care (ICPC) to classify medical topics (such as cough or breast cancer) (Gebel & Okkes, 2000; WONCA International Classification Committee, 2005). The Taxonomy of Generic Clinical Questions (TGCQ) was built to classify the nature of health questions into generic questions (Ely et al., 2000)—for example, “What are the side effects of medication X/therapy X?”

Websites that provide health information are often designed by professionals, but information that professionals consider useful for the public does not necessarily match the health information that the public is searching for. Professional information will be based on the professional knowledge structures, which may differ from the way of thinking of the general public. The distinction between a diagnostic test and a therapeutic procedure may not be relevant for a patient who has to go to a hospital for “minor surgery.” Nevertheless, it can be expected that health information needs of professionals should at least partially cover the health information needs of the public, which makes it interesting to study the applicability of professional classification systems to public information needs, instead of starting the development of a classification structure from scratch.

As far as we know, no one has attempted to apply these professional classification systems to questions about health from the general public. The aim of this study is to investigate the feasibility of applying two professional classifications to questions from the public regarding health information.

METHODS

Questions about health asked by members of the public were retrieved from a Dutch public health website on the Internet. First the subject (cough, breast cancer) was classified according to the ICPC-2. Second, the type of question (side effects, management) was classified according to the TGCQ.

Health Questions

The Dutch health website of study (gezondheidsplein.nl) provides information about health and disease. This website

resembles the U.S. website <http://www.medindia.net>. The website also provides an online facility to consult a physician for a fee of 10 Euros per question. This consultation facility covers distinct topics. In October 2007, 347 successive questions were extracted from the website and saved in an Excel spreadsheet.

ICPC-2

The ICPC-2 classifies the domain of primary care. This method of classification was developed by the World Organization of General Practitioners/Family Physicians (WONCA), and it is widely used in general practice in several countries (O'Halloran et al., 2004; Miller et al., 2000). The ICPC-2 classification consists of a letter (the location in the body; for example, L = musculoskeletal system) and a number for different components (i.e., symptoms/complaints [codes 1–29], or diagnoses/diseases [codes 70–99]) (Gebel et al., 2000; WONCA International Classification Committee, 2005) (Table 1).

TGCQ

The TGCQ consists of 64 generic clinical questions categorized according to four hierarchical levels of specificity (Ely et al., 2000). This taxonomy is based on questions from general practitioners for information retrieval to answer medical questions that have been asked by patients during consultation. The first level covers five broad areas: diagnosis, treatment, management, epidemiology, and nonclinical questions. Management questions relate to questions about what steps to take without distinguishing between diagnosis or treatment steps. For each of the five areas on this first level, there is also a category “not elsewhere classified.” A branching structure of secondary, tertiary, and quaternary levels further characterizes the generic questions. Each quaternary category is exemplified by one or more closely related generic questions. For example, the question “Is there a way to continue Lovastatin in patients with side effects of headache (such as reduce the dose)?” would be coded as “treatment” (primary), “drug-prescribing” (secondary), “adverse effects” (tertiary), and “administration in the face of adverse effects” (quaternary). The generic question corresponding to this quaternary category is “How can drug X be administered without causing adverse effect Y?” The taxonomy comprises 64 quaternary categories (Table 2).

An example of the application of a combination of both classifications can be illustrated with the lay question “Can the recurrence of my breast cancer be treated with herceptin since I also have heart failure?” The subjects (recurrence of breast cancer, heart failure, herceptin) are coded according to the ICPC-2 as respectively X76, K77, and X50, and the type of question is coded according to the TGCQ as “Is drug X indicated in situation Y for condition Y?”

TABLE 1
Structure of ICPC-2 (WONCA International Classification
Committee, 2005)

Chapters	Components
A General	1. Symptoms, complaints
B Blood, blood forming	2. Diagnostic, screening, prevention
D Digestive	3. Treatment, procedures, medication
F Eye	4. Test results
H Ear	5. Administrative
K Circulatory	6. Other
L Musculoskeletal	7. Diagnoses, diseases
N Neurological	
P Psychological	
R Respiratory	
S Skin	
T Metabolic, endocrine, nutrition	
U Urinary	
W Pregnancy, family planning	
X Female genital	
Y Male genital	
Z Social	

Examples of coding	
A03: Fever	A73: Malaria
D06: Abdominal pain localized: other	D41: Endoscopy of the stomach
F02: Red eye	F94: Blindness
H01: Ear pain/earache	H79: Ear injury: other
K02: Pressure/tightness of heart	K03: Cardiovascular pain NOS
K74: Ischaemic heart disease with angina	K75: Acute myocardial infarction
L03: Low back symptom/complaint	L41: MRI of the knee
N01: Headache	N89: Migraine
P03: Feeling depressed	P72: Schizophrenia
R05: Cough	R96: Asthma
S09: Infected finger/toe	S52: Surgical removal of lipoma
T07: Weight gain	T89: Diabetes insulin dependent
U04: Incontinence urine	U80: Injury urinary tract
W02: Fear of pregnancy	W75: Injury complicating pregnancy
X03: Intermenstrual pain	X85: Cervical disease NOS
Y14: Family planning male: other	Y83: Undescended testicle
Z04: Social cultural problem	Z23: Loss/death parent/family member problem

Analysis

All questions were first coded according to the ICPC-2 and then according to the TGCQ by the first author. If there was any doubt, the question was marked, and all marked questions were coded again in a second and a third coding round. If more than one code could be applied to the question, all applicable codes were documented. Feasibility was investigated by determining the percentage of questions that could not be classified, and by discussion between both authors about why these questions could not be classified. In addition,

the problems that arose during the classification process were recorded and the origin of these problems was discussed and ordered by both authors in relation to the structure and content of each classification.

RESULTS

Description of the Database

The 347 questions were translated into 452 subjects for the ICPC-2 coding, and 393 subjects for the TGCQ coding.

With the ICPC-2 classification, 67 questions contained two subjects, 11 questions had three subjects, 4 questions had four subjects, and 1 question had five subjects. Four subjects could not be coded. For 12 subjects, two codes were applicable, but no information was available to make it possible to decide between the two codes. The four subjects that could not be classified concerned a question about the address of a company providing dietary advice associated with blood tests, a question about whether quitting smoking can cause any health risks, a question about the delivery of a baby at home or in hospital, and a question about injury insurance claims.

With the TGCQ, 39 questions were classified with two subjects, 1 question had three subjects, and 1 question had six subjects. All but two questions were classified, although 21 subjects were assigned to one of the five "not elsewhere classified" categories. Two subjects remained unclassified (category 6.1.1.1).

Classifying Health Questions Asked by the Public

ICPC-2

Specificity. Some codes appeared to be too specific for coding health questions asked by the public. For example, "diabetes" (in general) cannot be classified, since ICPC-2 makes a distinction between insulin-dependent and non-insulin-dependent diabetes.

Another problem that arises is that certain codes are not sufficiently specific. An example is code A18, dissatisfaction with or worries about appearance. These worries may include a wish to gain weight, or lose weight, but also worries about appearance, or dissatisfaction with breasts, and many other issues.

Diagnosis versus symptoms. When people name a disease, it remains unknown whether this diagnosis has been made by a physician. For example, a question about cystitis may in fact be a question about urinary-tract symptoms.

Cause of complaint versus complaint. People may relate phenomena and occurrences to causes that are not necessarily interrelated. They may link pain in the skin of the back to a previous epidural, although it may well be some other type of pain in the skin of the back.

TABLE 2
Part of the Structure of the Taxonomy of Generic Clinical Questions by Ely and Colleagues (TGCQ) (Ely et al., 2000)

Level 1	Level 2	Level 3	Level 4	Examples	
1. Diagnosis	1. Cause	1. symptom	1.	1.1.1.1: What is the cause of symptom x?	
		2. sign	1.	1.1.2.1: What is the cause of physical finding x?	
		3. test finding	1.	1.1.3.1: What is the cause of test finding x?	
		4. unspecified	1.	1.1.4.1: Could this patient have condition y (given findings x1, x2, . . . , xn)?	
	2. Manifestations	1.	1.	1.2.1.1: What are the manifestations (findings) of condition y?	
		3. Test	1. indications	1.	1.3.1.1: Is test x indicated in situation y?
	4. Name finding	2. accuracy	2. accuracy	1.	1.3.2.1: How good is test x in situation y?
			3. timing	1.	1.3.3.1: When (timing, not indications) should I do test x?
4. preparation			1.	1.3.4.1: What is the preparation for test x?	
5. Orientation		5. method	1.	1.3.5.1: How do you do test x?	
		1. body part	1.	1.4.1.1: What is the name of this body part?	
6. Inconsistencies	2. condition	1.	1.4.2.1: What is the name of that condition?		
	3. test	1.	1.4.3.1: What is the name of that test?		
	1. condition	1.	1.5.1.1: What is condition y?		
7. Costs	2. test	1.	1.5.2.1: What is test x?		
	1.	1.	1.6.1.1: Why were this patient's findings inconsistent with usual expectations?		
2. Treatment	8. Not elsewhere classified	1.	1.	1.7.1.1: What is the cost of test x?	
		1. Drug prescribing	1. How to prescribe	1. Undifferentiated	2.1.1.1: How do you prescribe/administer drug x (in situation y)?
	2. Not limited to but my include drug prescribing	Continued. . .	Continued. . .	2. Dosage	2.1.1.2: What is the dose of drug x (in situation y)?
				3. Timing	2.1.1.3: When (timing, not indication) or how should I start/stop drug x?
					Diverse
	3. Not elsewhere classified	1.	1.	2.3.1.1	

Note. The complete taxonomy can be downloaded at the *British Medical Journal* website: <http://www.bmj.com/cgi/content/full/321/7258/429/DC1> (last visit: January 20, 2010) (last visit: July 18, 2008).

Localization of symptoms. The location of pain or other sensations can be described according to various anatomical structures. For example, "pain in the ribs" could be stomach pain or other upper abdominal pain.

Lay terminology for anatomical locations. The words *abdomen/belly* and *stomach*, or *lungs* and *airways*, are often used interchangeably by the public, whereas different codes exist for these in the ICPC-2, which may cause coding errors.

Use of medical terminology by lay people. Medical terminology may be used differently by the public than by medical professionals: e.g., *eczema* may in fact be a rash, and *asthma* may be confused with *dyspnea* or a cough.

The additional value of combining complaints. It is not possible to code a combination of complaints (apart from well-defined syndromes). Separate codes can be used for the distinct symptoms or complaints, but the occurrence of the symptoms at the same time may provide additional information that will be lost if only the separate symptoms are coded.

Preclinical (premedical) subjects. Some questions that are asked relate to decision making about seeking

professional help. For example, people want to know whether they should start worrying about a skin mole, or whether they should contact their general practitioner when a desired pregnancy does not occur. These questions arise in the premedical phase and are not included in the ICPC-2.

Coding of large disease groups. Large disease groups, such as cardiovascular diseases, play a prominent role in public health, and prevention campaigns refer to them as such. However, a question about, for instance, cardiovascular diseases cannot be coded with the ICPC-2, since more specific information about the type of cardiovascular disease is needed for this classification.

TGCQ

Preclinical (premedical) subjects. Questions relating to preclinical or premedical subjects cannot be coded. The nonclinical categories do not cover questions asked during an online consultation about whether or not to seek professional help.

Preventive procedures. Preventive procedures related to health promotion, such as dietary advice, cannot be classified in the current classification matrix. The preventive categories relate to medication or therapies used to prevent

conditions rather than to promote health. This problem applies to all questions about lifestyle.

Name-finding. Questions regarding name-finding can be classified in a number of main categories in the Ely taxonomy, such as the name of an illness, a test, or certain medication. However, for more categories, name-finding is a relevant subcategory, in particular in the category of therapies, not referring to prescribed drugs, and the category of lifestyle procedures. There is no code for name-finding in the current taxonomy.

Knowledge. Questions regarding standard medical knowledge cannot be classified either. Example of such questions are “Does syndrome X exist?” and “What can I expect to happen during test X?” The main area of epidemiology covers knowledge questions, but these questions are professional questions, and too specific for the public. Within the main area of diagnosis, there is a specification “orientation,” which is further subdivided into “condition” (“What is condition X?”) and “test” (“What is test X?”). However, it is doubtful that these questions cover the full range of questions asked by the public.

Where to go for a test or a treatment. The category of management > other providers > referral appears to be suitable, but the generic question belonging to this category is “When should you refer in situation Y?,” which does not cover questions about locations for test or treatment.

Physical finding versus symptoms. The difference between a physical finding and a symptom is that the first is not necessarily related to a disease, whereas a symptom is related to pathology. It is often unknown whether the question is about a pathological finding or a “normal” finding, which makes it difficult to choose between code 1.1.1.1 “What is the cause of symptom X?” and code 1.1.2.1 “What is the cause of physical finding X?”

Relevance of medical classifications for the public. Members of the public may refer to “treatment,” while the name of the treatment (e.g., colonoscopy) and the description of the procedure imply that what they want really is a diagnostic test. This implies that distinctions in the main areas of diagnosis and treatment may be less relevant for the questions asked by the public.

Pain. Many people ask questions about pain they experience after diagnostic tests, surgery, or other treatment. This type of pain is not always inherent to the natural course of the basic problem. It can be difficult to assess whether or not the pain is part of the natural course, or the result of a complication, in which case the complication should be coded differently.

Justification of the choice of a test or treatment. Questions regarding alternatives for invasive tests, the pros and cons of a specific treatment, or whether or not a test is necessary cannot be classified.

DISCUSSION

Various difficulties are encountered in the application of both professional classification systems to questions about health asked by the public. These difficulties must be solved before a combination of these two methods can be used as a research tool to classify the health information needs of the public. The present results are promising with respect to the low percentage of subjects that could not be classified (correctly), but both need to be studied in more detail.

Potential Adjustments in the Classification Structures

The difference in *specificity* between lay people and professionals resembles problems previously reported on differences between lay and professional health concepts (Keselman et al., 2008). A potential solution for this is to add an additional, main axis to the ICPC-2 codes, which enables users to choose a general category if the question cannot be further specified, e.g., in case of diabetes.

The issue of *diagnosis* could perhaps be solved by clustering the information about the topics, e.g., itchy versus non-itchy skin problems. Problems with lay terminology, such as the use of belly and stomach (interchangeably), could be solved in a similar way by combining the information about belly and stomach. It is therefore necessary that the question be further specified in a way that is appropriate for the specification procedure and the knowledge structure of the searcher/information-user.

The questions related to decisions in the *preclinical phase* require additional investigation. These topics are not included in the ICPC-2 because this classification was specifically developed for the clinical phase. Questions relating to the premedical domain also deserve a specific place within the TGCQ. One suggestion is to add another main area about preclinical questions (Should I worry? Should I contact a doctor?). A second suggestion is to place these questions within each main area, since each phase in the process, whether it concerns diagnosis or treatment, is associated with uncertainties. These uncertainties may lead to questions about whether or not to undertake action, or whether or not the noticed difference or the absence of progression is normal or abnormal. This also applies to questions about pain after tests or treatment (Is the pain an essential part of the test, or is it abnormal?).

Questions related to *prevention or health promotion* deserve to be given a distinct main area in the TGCQ, since they do not belong to the disease or treatment-oriented main areas, or to the area of epidemiology. One suggestion is to separate questions relating to health promotion from disease or treatment-oriented questions. Specification of the health promotion questions could include questions about where to

find information or where to find an institution to develop a health promotion program. Further research should focus on the detailed specification of the health promotion area of the taxonomy.

General medical knowledge that is not *common knowledge* for the public should also be added to the TGCQ. This could be added to the epidemiology area. A category of “common knowledge about health and disease” could be added at the level of prevalence/incidence, course, and prognosis.

Questions that remain unclear as to whether they concern *diagnosis or treatment* should be placed under management in the TGCQ. However, the “professional” distinction between diagnosis and treatment remains relevant in certain cases. On the other hand, if the taxonomy is used to classify information needs of the public, attention should be paid to the lack of relevance of this distinction from the viewpoint of the users.

Questions relating to *where to go* for a diagnostic test, treatment, or health promotion activities should be added to the categories within the specific main areas.

A generic question regarding *name-finding* should be included in the therapy section of the TGCQ, the category of “not limited to, but may include drug prescribing.” Questions about name-finding should also be included in the lifestyle area.

A *distinction between physical finding and symptom* is necessary in both the TGCQ and the ICPC-2. If it remains unclear whether the finding relates to a pathological (symptom) or a normal manifestation (physical finding), a generic category could be included at a previous level in the classification.

The last suggestion for adaptation is to include a generic question in all main areas of the TGCQ about *pros and cons*, which would cover questions about the justification of (the choice of) treatment or diagnostic tests and health promotion activities.

Methodological Considerations

We assume that the problems encountered during this study do not reflect the total range of problems that may arise when using these two professional classification systems as a research tool to classify the health information needs of the public. First, the financial threshold of 10 euros per question might exclude people who cannot afford this amount. However, when considering the aim of this study, i.e., the assessment of feasibility, it can be expected that the problems we encountered in this study will also be encountered by the general public, but we may have missed some due to population bias.

Second, there may be differences between health questions that people prefer to discuss with a health professional and health questions that they hope will be answered by posing questions on public forums or by browsing the Internet. It can be expected that questions asked during an

online consultations with a health professional, like those we studied, will resemble the information structure of professionals to a greater extent than questions typed into search engines.

Implications for Research and Practice

Although adaptations are necessary, both classification tools can be a good starting point in the development of a classification system for questions about health asked by the public. Validity and reliability were not investigated in this study, but should be assessed next. The validity should be investigated in a broader range of health questions asked by the public to gain insight into the specificity and sensitivity of both classification systems. The present study focused on questions asked during an online consultation, directed to one specific health professional. Further research on health forums and searching behavior will probably identify a much broader range of health questions asked by the public. Health communication scholars may use this tool for research purpose, either to further evaluate the tool or to increase their insight in needs of the public in general or specific subpopulations. Although much research is needed, the eventual tool can be used to help health professional to design health information, e.g., on websites, that matches the needs of the public. For patients, this may increase the likelihood of finding useful information.

Classification Matrix

If the two classification structures we studied are found to be valid and reliable and when the problems that were encountered can be solved, the next step will be to combine these classification structures into a classification matrix (Table 3). This matrix could be useful for indexing public requests for health information as well as documents or databases concerning health information. In the long run, the match between the information that is needed and the information that is available could be made easier by the use of a common index, one axis representing the subject matter of the question (structured according to the adapted version of the ICPC-2) and the second—and optional third—axis representing the essence or content of the question (according to the TGCQ). Double axes seem to be necessary because some questions contain a combination of elements.

Conclusion

The two classification systems used in the professional domain cannot be applied to questions about health asked by the public without adjustments. However the results are promising and suggest that future research should focus on validity and reliability and solving the problems encountered in the present study.

TABLE 3
Provisional Example of a Classification Matrix of Questions of the Public Regarding Health Information

TGCQ	ICPC					
	A03 Fever	F02 Red Eye	H01 Ear Pain H50 Painkillers	L41 MRI of the Knee	R05 Cough R78 Acute Bronchitis	T89/T90 Diabetes . . .
1.1.1.1: What is the cause of symptom x?						
1.1.3.1: What is the cause of test finding x?						
2.1.1.1: How do you prescribe/administer drug x (in situation y)?						
2.1.1.3: When (timing, not indication) or how should I start/stop drug x?						
3.1.1.1: What management options are there in situation y?						
3.2.1.1: How do other providers manage condition y?						
4.1.1.1: What is the incidence/prevalence of condition y (in situation z)?						
4.2.1.1: Is x a risk factor for condition y?						
5.1.1.1: I need to learn more about topic X						
...						

Note. When the matrix is used as a research tool, questions of the public can be categorized in this matrix. The cells that are filled indicate the health information needs.

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