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TRABAJO DE FIN DE GRADO

Lexico-grammatical aspects of the translation of a
medical research paper about hepatitis

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ABSTRACT

The aim of the present undergraduate dissertation is to provide a translation for the medical research paper “Chronic Hepatitis C Virus Infection in the United States, National Health and Nutrition Examination Survey 2003 to 2010” published in the journal *Annals of Internal Medicine* and, additionally to analyze the most recurring translation procedures. In order to reach this, an analysis of the main features of Languages for Specialized Purposes is conducted. The query of several parallel texts in Spanish as well as the creation of a specialized purpose corpus is essential for the text translation. An analysis of the most recurrent methods of medical translation is provided so as to conclude that nominal groups, passives and transpositions are the most recurrent translation techniques when dealing with the translation of a medical research paper.

Keywords: languages for specialized purposes, medical translation, hepatitis C, translation procedures, medical language, parallel texts.

RESUMEN

El objetivo de este proyecto es proporcionar la traducción del artículo original “Chronic Hepatitis C Virus Infection in the United States, National Health and Nutrition Examination Survey 2003 to 2010” publicado en la revista *Annals of Internal Medicine*, así como analizar los principales métodos de traducción utilizados para la misma. Para lograrlo ha sido necesario el estudio de las características más importantes del lenguaje especializado, además de la consulta de textos paralelos en español y la elaboración de un corpus especializado. Finalmente, se proporcionará un análisis de los métodos de traducción más importantes para mostrar la importancia que tienen los grupos nominales, la pasiva y las transposiciones en la traducción médica de un trabajo de investigación clínico.

Keywords: lenguaje especializado, traducción médica, hepatitis C, métodos de traducción, lenguaje médico, textos paralelos.

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LIST OF ABBREVIATIONS

Abbreviation	Term
GL	General language
TL	Target language
ST	Source Text
TT	Target Text
LSP	Language for Specific Purposes
LGP	Language for General Purposes
GL	General language

1. INTRODUCTION

The 88% of scientific and technical texts are originally written in English. That is why the translation from English to another languages is essential to receive scientific knowledge. It is also necessary to highlight that when a scientific medical article is published, it must be translated as soon as possible, because medicine is a science that is constantly changing. So that, if texts are not immediately translated after being published, the information that the reader of the translation receives may be obsoleted. The importance of the translation is obvious. Nowadays, 50% of scientists can not read a half of the total publications because they are not fluent in the original language in which these texts are written.

It is not easy to determine if translators are the most suitable people to translate a scientific article or if doctors should be the ones who do this job. I would like to point out that the person who wants to do a correct translation should have a perfect knowledge and dominance not only of the ST, but also of the TT. Besides, the translator should have knowledge of the field in which he/she is working and should also dominate the terminology. Regarding the specific case of medicine, the translator of a research paper should try to achieve a standardization of the translation using a normalized terminology. In the medical field we can find two types of terms: terms coming from general language (GL), such as *tonsillitis*, and terms coming from the specialized domain of medicine, such as *amigdalitis*. The terms coming from GL, that is 'subtechnical terms', are the ones that are more problematic when finding equivalents in the target language (TL). We will be explaining medical terminology in the theoretical background of this undergraduate dissertation.

This undergraduate dissertation consists of 5 sections: an introduction, a theoretical background, the methodology, the translation comments and the conclusion. In the theoretical background what translation is will be explained, as well as the different stages of the process of specialized translation. After that, we will be dealing with the syntactic and morphological distinctive features between English and Spanish. Knowing

the differences between these two languages will help us to do an accurate translation. The last part of the theoretical framework is focused on the concept of 'language for specific purposes' (LSP), its features and how terminology is used in LSP. This is an important topic because this undergraduate dissertation is based on a specialized text (a scientific-medical text). In the methodology it is explained how the corpus has been created and the parallel texts used for this compilation, as well as their structure, features and impact factor. Then the results and translation comments section will be explained. First, I will deal with the theme and genre of the translated article as well different classifications of the text according to several authors. After that the methods used for the translation are explained. Every relevant term, as well as its equivalent in Spanish are classified in tables according either to the method that has been used for its translation, or to the type of term that we are dealing with. Finally, we can find the conclusion and the bibliography used to write this dissertation. In the annexes, the original text is included with its complete translation into Spanish.

2. THEORETICAL FRAMEWORK

2.1 THE PROCESS OF TRANSLATING

As we are dealing with translation, it is necessary to know what it is. Foster (1958) asserted that “translation is an act through which the content of a text is transferred from the source language in to the target language.” Another accurate definition is the one given by Ghazala (1995) when he said that “translation is generally used to refer to all the process and methods used to convey the meaning of the source language in to the target language.”

According to García Yebra, (n.d.) there are two translation stages. The first one consists of the understanding of the original text and the second stage is the reproduction of the assimilated information into the TL. The translator’s aim is to reproduce the message of the ST in a coherent way, being loyal to the meaning and resulting spontaneous and natural at the time of being read or heard in the TT. The Italian author Adamo (2002), points out that to reach a great translation, the translator should analyze the sociological, linguistic and cultural features surrounding the ST and the TT. The translator should also have a good knowledge of the specialized terminology.

Teresa Cabré (2004) divides the process of translation in four different stages:

- During the first level the translator focus on terminology. This stage comprises the searching of databases, encyclopedias or specialized dictionaries. Sometimes the translator is not able to find the term and in this case the best option is to do a literal translation or to explain what the term means.
- In the next stage the translator uses his linguistic competence and creates neologisms when they are needed.
- The third step is the center of the terminological process. It deals with the creation of a database where all the terms are compiled. This allows the translator to analyze the terms easily as well as to solve the translation problems that appeared during levels one and two.

- During the last level the translator creates a specialized glossary that can be useful for other translators dealing with similar fields.

2.2 DISTINCTIVE FEATURES BETWEEN ENGLISH AND SPANISH

2.2.1 Syntactic structures

In the following pages, the distinctive features between English and Spanish regarding to syntax will be explained, as well as the most common ways of translating these structures from the TT in English into the ST in Spanish.

2.2.1.1 Extension and linking of sentences

According to Lopez Guix and Wilkinson (2001) “one of the biggest syntactic differences between English and Spanish is the extension of phrases and sentences”. English tends to use simple structures separated with punctuation marks elements; on the other hand, Spanish uses the subordinated structures. While in Spanish the excessive use of dots between sentences can provoke a feeling of monotony and a weak domain of linguistics, in English this is a symbol of expositive clearness. So that, at the time of translating, the translator into Spanish must extend the clause using coordination and subordination. English language uses repetition and anaphoric references to maintain discursive cohesion. This cohesion is searched by the use of participles, gerunds and deictics (demonstratives, adverbs of place and time, personal pronouns and articles). Due to all the mentioned features we can conclude that English tends to use simple sentences and anaphora to reach the discursive cohesion. However, Spanish prefers complex clauses because repetition is seen as a depletion of linguistic resources.

2.2.1.2 Linking within clauses

English language shows preference for juxtaposition and coordination compared with the number of times that subordination appears in written texts. So that, at the time of translating these structures into Spanish, the translator should connect these clauses adding linking words and conjunctions. Lopez Guix and Wilkinson (2001) show this technique using the following example:

Linked with Guatemala in colonial days, Chiapas became a Mexican State in 1824; its boundaries were fixed in 1882.

“Unida a Guatemala en la época colonial, la región de Chiapas se convirtió en un estado mejicano en 1824, y sus fronteras quedaron fijadas en 1882”.

As we can see in the previous example, English applies juxtaposition using a semicolon to link two sentences. However, this is translated to the TL by using coordination.

It is necessary to mention the way of translating relative pronouns into Spanish. These terms are commonly omitted or dispensable in English but not in Spanish. The following examples show how to make an accurate translation of these structures:

We thought it must have been an accident.

“Pensamos que debía de haber sido un accidente”.

Eventually came the day we visited the United States.

“Al fin llegó el día que visitamos Estados Unidos”.

Both examples require the item “que”. In the first example “que” acts as a conjunction introducing a subordinate clause and in the second it is a relative pronoun introducing a subordinate adjective clause.

2.2.1.3 Word order

Every language has a specific word order. Spanish language enables more variations than English regarding to word order, one of the causes for this is that the Spanish verb inflection is really rich. Besides, Spanish is a [+ null subject language], this means that subject omission is perfect acceptable, while in English it is not in most of the cases. Therefore, a translator should avoid calques of pronominal subjects in the translation from English into Spanish.

Other English syntactic feature that we should mention is the English tendency to place verbs at the end of the sentence. Lopez Guix and Wilkinson mention that there are infinite ways of translating this into Spanish, but all of them coincide on avoiding to place the verb at the end of the sentence. He shows this in the following examples:

When a wave passes, it distorts space so that the lengths of the tubes vary.

“Cuando pasa una onda, distorsiona el espacio, con lo cual varían las longitudes de los tubos”.

These artificial languages have not made much progress, though an international society of Esperanto speakers does exist.

“Estas lenguas artificiales no han realizado grandes progresos en su difusión, a pesar de la existencia de una sociedad internacional de esperantistas”.

In the first example the placement of the verb varies from final position in English, to second position within the sentence in Spanish. The second example shows a transposition where the English verb is translated into a noun. So this means that, the translation into Spanish must not place a verb in final position.

2.2.2 Morphological elements.

2.2.2.1 Adjectives

English adjectives have two main features: they do not have gender or number inflections (so they are not variable) and they are placed before the noun in most cases. However, in Spanish some adjectives are not variable and a great amount of them have gender inflection and almost all have number inflection. Besides the expressive value of Spanish adjectives changes depending on their position with respect to the noun. Lopez Guix and Wilkinson (2001) explain that a translator should think before applying syntactic calque at the time of translating English premodifier adjectives into Spanish. They encourage the translator to analyze the meaning of the adjective and decide whether to translate it as a premodifier or a postmodifier. It has to be taken into account that in Spanish a premodifier adjective has an ornamental use to make reference to an implicit feature of the noun (See example 1). Premodifier adjectives can also have a figurative use in the cases in which the adjective is commonly placed after the noun in Spanish (see example 2); meanwhile, a postmodifier adjective has an explicative or distinctive function.

Example 1: “la blanca nieve”.

Example 2: “la hermosa mujer”.

Example 3: “el niño rubio”.

Other English feature that we should bear in mind is the use of one adjective to qualify several nouns. The authors warned us that, in the translated version, the adjective should refer to all the nouns and not only to the first one, as it is shown in the following example:

Spanish biblical translator, humanist, and Catholic martyr.

“Traductor bíblico, humanista, y mártir católico español.”

However, English adjectives do not always qualify the following noun. So, again, the understanding of syntactic structures is really important for the translator:

The body cavities were filled with powder of myrrh and other aromatic resins and perfumes.

“Las cavidades corporales se rellenaban con polvo de mirra y otras resinas aromáticas, así como con perfumes”.

The previous example is a sequence, so its elements must be classified and the relation between those elements must also be analyzed in order to assign location to each of them in the TL.

Apart from what is mentioned above, we should also highlight the common use of noun adjectivization in English. This rarely happens in Spanish, so translators must use transposition or modulations to translate them. Lopez Guix and Wilkinson show us a clear example of this construction and a possible translation:

In principle, a translational analysis of the SL text based on its comprehension is the first stage of translation and the basis of the useful discipline of translation criticism.

“En principio, un análisis traductorio del texto de la LO basado en su comprensión constituye la primera frase de la traducción y el fundamento de la útil disciplina de la acrílica de traducciones”.

As we have seen, the placement of adjectives within a sentence must be interpreted using linguistic sensibility as well as lexical, morphological, and syntactic resources of the TL.

2.2.2.2 Verbs.

English verbs are extremely simple in terms of morphology, while Spanish verbs have a rich morphology. The main differences between English and Spanish verbs will be explained in the following lines:

- The main difference deals with agreement: Spanish is wider than English. Second and first person of verbs, do not indicate number or gender, so the translator must interpret who the author of the action is and relate this verb with the suitable subject.
- Progressive tenses are used in English to make reference to past, present and future, while in Spanish the progressive aspect is not so common. So that we should not translate these structures using the calque as a translating technique because the result will be too many progressive structures, which means a way of linguistic interference from English to Spanish.
- English does not have a past tense similar to the Spanish *pretérito imperfecto*. Past simple is used for spontaneous actions and for usual ones, while in Spanish the *pretérito perfecto simple* and the *pretérito imperfecto* are used respectively for these cases. Therefore, the translator must analyze the context in order to determine which Spanish past tense should choose for the translation.
- English past simple has two functions: to talk about finished actions and about past and usual actions. However this tense can be translated into Spanish by using the *pretérito perfecto simple*, if we are dealing with finished actions that are independent from any other actions; the *pretérito perfecto compuesto* if it is an action that finished

recently; and the *pretérito imperfecto* for usual actions and states that are not temporary limited.

- Future tenses are expressed in English by using “will/shall” + infinitive; “be going to” + infinitive; present of the verb “to be” + gerund; present tense; “will/shall” + “be” + “-ing”; “be to” + infinitive, and by using “be about to” + infinitive. These forms are translating into Spanish by using *presente simple*, *futuro* or *perífrasis verbal de infinitivo*.

- When we are dealing with offerings, “shall” and “will” must be translated into Spanish by using *presente simple*.
- Other two English forms that must be translated into Spanish by using the *presente simple* are predictions and insistences, as it is shown in the following examples shown by López Guix and Wilkinson (2001):

On average, French men will report having 13 sexual partners in their lifetime, while women will report between 2 and 5.

“Por término medio, los franceses declaran tener relaciones sexuales con 13 personas distintas a lo largo de su vida, mientras que las francesas entre 2 y 5 parejas”.

She will keep interrupting me.

“No para de interrumpirme”.

“Se empeña en interrumpirme”.

- Regarding the past participle, its use is the same for English and Spanish. It is used to form the perfect tenses and the passive voice. However, English has a higher rate of use of participle, so in some situations the translator into Spanish should avoid the use of participles and substitute them by nouns or verbs, as it is shown in the following examples:

Their mission accomplished, they began the long journey home.

“Una vez cumplida la misión, emprendieron el largo viaje de regreso”.

The contract signed, I was now committed to working for the company for the next three years.

“Tras firmar el contrato, me veía obligado a trabajar para la compañía durante los siguientes tres años”.

-Passive voice is more frequent in English than in Spanish. Authors such as Cuervo (1955) criticize some author's tendency for overusing the passive voice in Spanish. This structure tends to be avoided by translators, who substitute it by using impersonal forms, active voice or the *pasiva refleja*.

English passive voice has a great amount of specific features explained by López Guix and Wilkinson (2001):

- In English, the subject of the passive sentence can be either the direct object or the indirect object of the active sentence:

1. *They sent him a reminder.*

2. *A reminder was sent to him.*

3. *He was sent a reminder.*

Examples 1 and 2 are grammatically correct in Spanish (“Le enviaron un aviso” and “Le fue enviado un aviso”), although the structure of example 2 is not common. However, example 3 is ungrammatical in Spanish so it should be translated using an impersonal active sentence: “Se le envió un aviso”.

- English passive can be used with intransitive verbs, while in Spanish this is not possible, that is why we should use other resources at the time of translating them:

The policeman was laughed at.

“El policía fue objeto de burla”.

The bed hadn't been slept in.

“En la cama no había dormido nadie”.

- Progressive forms are also used with English passives, but this is not a possibility of Spanish, where these structures are translated by using *pasiva refleja*, *presente simple*, *pretérito imperfecto*, *perfecto simple* or *voz activa impersonal*:

Research is being carried out on the mainstreaming of deaf children in the ordinary classroom.

“Se llevan a cabo investigaciones en relación con la integración de niños sordos en clases de niños sin problemas auditivos”.

Passengers were being warned of delays due to security checks

“Se avisaba a los pasajeros de que había retrasos provocados por los controles de seguridad”.

- In some cases, English passive of infinitive or gerund is translated by using Spanish subjunctive case:

She wishes to be informed immediately of his arrival.

“Quiere que le comuniquen su llegada en el acto”.

2.3 LANGUAGES FOR SPECIFIC PURPOSES

As we are going to deal with a specialized text (a scientific-medical text) it is essential to know what Languages for Specific Purposes (LSP) are, as well as their features and how terminology is used in them. This will be explained in the following pages.

2.3.1 Concept of Specialized Languages

There are several definitions for LSP (Language for Specific Purposes). I would like to highlight the one provided by Varantola:

“Special languages are semi-autonomous, complex semiotics systems based on and derived from general language; their use presupposes special education and is restricted to communication among specialists in the same or closely related fields”. (Varantola, 1986: 23)

From this definition we can observe that the author considers specialized languages as subcodes, mostly pragmatic subcodes, of the global language. However, other authors support the complete independence of specialized languages against the global language. They consider LSP as independent codes, with specific units and rules. Hoffman (1984) is one of these authors since he claims that LSP are “a complete set of linguistic phenomena occurring within a definite sphere of communication and limited by specific subjects, intentions and conditions”. By using this definition Hoffman makes clear that extralinguistic and communicative elements must be considered at the time of determining the specificity of specialized languages. However, it must be considered that specialized languages have common features.

2.3.2 Features of Specialized Languages

Cabré (2004) highlights that LSP are not the same as artificial languages or invented languages. It is important to mention the main features that a code must have to be considered LSP, according to this author:

- They can not be considered invented languages because they are strongly influenced by the GL.
- Specialized languages have not been built having the language as a referent, but they are part of the language.
- These languages may admit new terms and structures, so their development is continuous. However, these terminological additions should be revised by experts.
- They usually provide one term for each concept.
- Every syntactic possibility that can be applied to GL can be also applied to LSP.
- They do not have a limited set of signs.

2.3.3 Ways to identify a specialized language

Cabré uses the term specialized language referring to a subcode pragmatically characterized by the topic, the users of the language and the communicative situations. For defining an LSP we have to consider the following asserts:

- A specialized topic does not belong to the general knowledge that the speakers of a language have.
- This specialized knowledge is usually known by professionals.
- Communicative situations also influence the degree of speciality of a subcode since a specialized language should appear in a formal context.
- A special language is defined by certain linguistic features (terms and rules) and by textual features such as the type of texts or documents.
- Special languages are not monolithic subcodes, but they have varieties depending on the use and on the communicative situations. These varieties can appear as a result of historical, geographical and social dialects or due to the personal linguistic style of the person using the language.

2.3.4 Variations in LSP

In 1986 Varantola highlights that:

“On the continuum formed by different SL’s, we would discern the prototype areas of various fields such as science, technology, law, religion, etc., and also determine interface areas where the different fields fuse”.

(Varantola, 1986: 26)

With this assertion the author explains that from a thematic point of view, specialized languages can be divided into different thematic areas, each of them, by itself, constitutes a determined specialized language and all of them together form a general specialized language. Therefore, LSPs permit several variations. For instance, two scientific texts dealing with the same topic but written in two distant dates, can be really different not only regarding to the terminology, but also to their expressive aspects. Besides, the geographical origin of the authors of specialized texts can also have a great influence in the way in which these documents are written. To solve the difficulties that these variations can cause, it is necessary to highlight that the main objective of LSP is to offer and exchange of information that must be accurate and free of ambiguities. Experts do not give any importance to these dialectal variations and linguistic peculiarities and they focus on a great communication.

Due to the aspects mentioned before, we can consider that LSPs have many resources in common with LGP (language for general purposes), but LSPs are more international and universal than LGP. However, it is really difficult to establish a clear boundary between LSPs and common language, as well as to establish a border between different LSPs.

2.3.5 The role of terminology in LSPs

Terminology has an essential role within the process of translation, specially if we are dealing with a specialized text. According to Adamo (2002), the main objective of terminology is the individualization and determination of conceptual unities of a

specialized field, so that, their translation would be accurate. In most cases these terms are simple or complex linguistic units that constitute the center of the sentence in a specified context.

Specific terminology is the element that easily allows us to distinguish not only LSPs from LGP, but also different LSPs to each other. So that terminology has an essential role to define and classify different types of LSPs.

Rondeau (1983) asserts that LSPs are mainly characterized by their lexicon and by the semantic features of the texts where they are used. There are 3 aspects that help to create a concise aspect appearance of the specialized text and the international communication. Those aspects are:

- A concise terminology (especially when it is not an adaptation of a foreign language).
- A formal terminology.
- The international nature of the terms.

2.3.6 Specialized terms

According to Cabré (2004) specialized terms have a referential and informative function. They do not deal with a general topic, but with a specialized one. We can just consider that a word is a term if it is within the boundaries of a specialized field, this means that they do not make reference to general lexicon or to activities that can result familiar for every speaker. Terms and terminology are usually used by professionals specialized on a certain area. Specialized terms are common in certain situations. They are used in formal environments and not in familiar or colloquial contexts.

3. METHODOLOGY

3.1 CORPUS CREATION

Translating a text successfully implies many steps and one of the most important ones is to find some parallel texts that will guide the translation. That is why I have created a corpus consisting of 7 samples that constitute a total of 20,843 words. I consider this number of words enough to create a good corpus where I can analyze the terminology and grammatical features of research papers related to hepatitis. All the files containing the texts are collected in a corpus under the heading: *Corpus Hepatitis-Research Paper*.

Talking about the subject field, as I have previously mentioned, I have chosen medical articles related to the subfield of ‘hepatitis’. The genre of all the texts belonging to the corpus is ‘medical research papers’. The original language of all these articles is Spanish and none of them is a translation from English or other languages.

Due to the fact that all the texts are research papers the format or structure of all of them is the same that I mentioned previously: Abstract, Introduction, Methods, Results and Discussion. Although in some cases the name of these sections differs from one text to another, their content is closely related. The articles that constitute this corpus are published in the following four Spanish medical journals: *Medicina Clínica (Barcelona)*, *Gastroenterología y Hepatología*, *Revista Clínica Española* y *Revista Española de Enfermedades Digestivas*. (See table 1)

After having explained how the corpus has been created, I would like to determine the target group the corpus is aimed at. It is addressed to every knowledgeable professional within the framework of medical translation and specially in the field of ‘hepatitis’. However, this corpus may also be interesting for doctors and for every professional whose job is related to medicine. The main use of the database and corpus is to serve as a terminological source and as a medium to find information about the digestive system for our translation.

It is necessary for the users to have some skills before using the corpus. It would be advisable to have a high level of Spanish. As it has been mentioned before, the corpus is constituted by articles in Spanish, since they are going to be used as parallel texts to translate a research paper from English to Spanish.

The image below shows the impact factor of the chosen texts compiled in the corpus. The impact factors shown in the image are not high if we compare them to the ones from the English medical journals. Spanish journals do not usually have high impact factors in the field of medicine, mainly due to the use of Spanish vs English. However, the texts chosen as parallel texts have high impact factors in terms of Spanish publications and are mostly read by Spanish doctors, according to experts in the gastroenterology field.

	A	B
1	Source	Impact Factor 2014*
2	Medicina Clínica (Barcelona)	1.417
3	Gastroenterología y Hepatología	0.838
4	Gastroenterología y Hepatología	0.838
5	Revista Clínica Española	1063
6	Gastroenterología y Hepatología	0.838
7	Revista Española de Enfermedades Digi	1.414
8	Revista Española de Enfermedades Digi	1.414

Table 1. Composition of the corpus for the translation

4. RESULTS :TRANSLATION COMMENTS .

In this section the methods used to translate the terminology and the most problematic grammatical structures will be explained.

4.1 SOURCE TEXT: BACKGROUND

The translated text is “Chronic Hepatitis C Virus Infection in the United States, National Health and Nutrition Examination Survey 2003 to 2010”, a research paper (original research) published in the journal *Annals of Internal Medicine*, comprised in volume 160. It deals with the study of chronic hepatitis C virus infection in the United States in order to find the best possible medicine to help diagnose this disease. This paper has conventions about the layout (superstructure), form and style that are usually standardized and it has the IMRAD superstructure of research papers. As it is explained by Méndez Cendón (2014-2015), that means, it includes an Abstract, an Introduction, a Materials and Methods section, a Results section and a Discussion. I have chosen this text due to the fact that ‘hepatitis C’ is a condition that interests me a lot. Besides, as it is shown in its webpage, *Annals of Internal Medicine* is ranked 5th among 154 general medicine journals. It is one of the most highly cited and influential journals in the world. It is also asserted in this previous source that “the most recent (2016) Impact Factor for *Annals of Internal Medicine* is 17.202—the highest of any specialty journal in the Clarivate Analytics’ General and Internal Medicine category.”

It should be noted that according to Hatim and Mason's classification of text types (2014), the predominant function in this text is expository. Its purpose is to inform the reader about accurate information through a reliable source. In addition, this research paper has a referential function because it is used to represent phenomena of the world; in this case, it describes the chronic hepatitis C virus. Then, it would have an informative sub-function since its purpose is to communicate the facts of this virus. This scientific writing is characterized for having a high level of formality and objectivity; non-personal use of language; low use of first and second personal pronouns and a low use of articles (Méndez-Cendón, 2014-2015).

According to Pearson's classification of communicative contexts (1998), this text is an expert-to-expert text. Experts do not explain any terminology in this type of texts. The author, as well as the reader, share a common language and knowledge, so they are assumed to have similar level of expertise. In addition, both of them understand the terms and structures used and there are not definitions of complex terminology.

According to Göpferich's classification (1995), the source text is a progress-oriented actualizing text, that means that it conveys information intended to advance science and technology. Due to the fact that it is a research paper, it would be a text with sophisticated presentation.

4.2 TRANSPOSITION

Transpositions are commonly used at the time of translating a scientific text. García (1993: 139) defined transposition as “A shift in the grammatical structure without modifying the meaning and basic vocabulary when translating from one language into another”. The author explains that by using transposition we obtain natural structures that are usually produced in the TT, instead of forced sentences that try to be similar to the ones in the ST. Transpositions are also used in cases in which the grammatical structure of the ST does not exist in the TT. I have translated different grammatical categories by using transposition:

- Past participles are some of the structures translated by using a transposition (See table 2). A relative clause is sometimes needed for translation of a past participle (See examples 1-3 in table 2). I have applied this type of transposition several times along my translation.
- It is also necessary to bear in mind the transpositions used to translate adverbs. By using transposition on table 3, the elements have the same meaning in both languages, follow the grammatical rules and sound natural at the time of reading them.
- Transposition is also used as a translation resource at the time of translating gerunds. Examples of English gerunds translated into Spanish using transposition are shown in table 4. I have translated examples 1 and 2 by using a relative clause. A conditional sentence in Spanish is the result of using a transposition to translate example 3. Besides, we can observe a gerund transposed into a preposition in example 4.

ENGLISH	SPANISH
persons ever infected	personas que nunca han estado infectadas
residents in the population sampled by NHANES	residentes en Estados Unidos de la muestra de NHANES

ENGLISH	SPANISH
to determine risk factors and exposures associated with chronic infection.	para determinar los factores de riesgo y las exposiciones que se asocian a la infección crónica.
persons aged 16 years or older	personas de 16 años o más
(...) no more than one half of persons with chronic HCV infection have been tested for anti-HCV;	(...) no más de la mitad de personas con infección crónica del VHC han sido sujetas a un análisis de anti-VHC;
of the 43 898 persons aged 6 years or older sampled in NHANES	de las 43 898 personas de 6 o más años de edad de la muestra de NHANES
However, many persons infected with HCV remain untested and unaware of their infection (...)	Sin embargo, muchas personas infectadas por el VHC permanecen sin ser sujetas a examen e inconscientes de la infección (...)
(...) no more than one half of persons with chronic HCV infection have been tested for anti-HCV;	(...) no más de la mitad de personas con infección crónica del VHC han sido sujetas a un análisis de anti-VHC;
Risk factors are essentially unchanged from previous periods and were reported by only about one half of infected persons.	Los factores de riesgo no han variado con respecto a periodos anteriores y se han descrito solo en alrededor de la mitad de las personas infectadas
Although increased successful treatment of HCV infection might also cause a decrease in prevalence estimates since the last survey,	Aunque el incremento del tratamiento exitoso de la infección por el VHC pueda causar también una disminución de la prevalencia estimada desde el último estudio

Table 2. Transposition of past participles

ENGLISH	SPANISH
cronically	de manera crónica
retrospectively	de forma retrospectiva

ENGLISH	SPANISH
untested	sin ser sujetas a examen.
nationally	a nivel nacional
significantly	de forma significativa
accordingly	en consecuencia
approximately	aproximadamente
annually	anualmente

Table 3. Transposition of adverbs

ENGLISH	SPANISH
The prevalence of HCV infection was 1.0% (95%CI, 0.8% to 1.2%), corresponding to 2.7 million chronically infected persons.	La prevalencia de la infección por el VHC es de 1.0% (95%IC: 0,8 a 1,2), que se corresponde con los 2,7 millones de personas infectadas
The estimated prevalence of anti-HCV among persons aged 6 years or older was 1.3% (95% CI, 1.2% to 1.5%), corresponding to approximately 3.6 million persons (CI, 3.0 to 4.2 million persons) with past or current HCV infection in the general U.S. population.	La prevalencia estimada de anti-VHC en personas de 6 o más años era del 1,3% (95% IC; 1,2% a 1,5%), lo que corresponde aproximadamente a 3,6 millones de personas (IC, 3,0 a 4,2 millones de personas) con infección pasada o actual por el VHC en la población general de Estados Unidos.
Using NHANES data from 2003 to 2010, we estimated that 1.3% of persons in the general U.S. population,(...), had anti-HCV...	Si utilizamos los datos de NHANES desde 2003 hasta 2010, estimamos que el 1,3% de la personas de la población general de Estados Unidos, (...) tenían anti VHC...

ENGLISH	SPANISH
<p>Serum samples that were confirmed positive or indeterminate for anti-HCV were further tested for HCV RNA using an in vitro nucleic acid amplification test for the quantitation of HCV RNA in human serum or plasma.</p>	<p>Las muestras de suero que se evaluó como positivas o indeterminadas para el anti-VHC fueron posteriormente sometidas a una prueba para el ARN VHC mediante una prueba de amplificación de los ácidos nucleicos in vitro para la determinación cuantitativa del ARN VHC en el suero humano o plasma humanos.</p>

Table 4. Transposition of gerunds

4.3 LATIN AND GREEK PREFIXES AND SUFFIXES

Latin and Greek prefixes and suffixes are used in medical academic and professional registers. They have their own meaning and terms formed with these affixes are called international terms since they stay the same in all languages. The ones that appear in the translated text are shown in the following table as well as their equivalents into Spanish and meanings. (See table 5)

ENGLISH	SPANISH	MEANING
cirrhosis	cirrosis	-osis: Combining form meaning a process, condition, or state, usually abnormal or diseased; production of an abnormal substance, increase of a normal substance, or parasitic infestation (Farlex Partner Medical Dictionary, 2012).
epidemic	epidemia	epi-: Prefix denoting upon, over (American Heritage Dictionary, 2011). -demic: relating to people or a district (Mosby's Medical Dictionary, 2009).
hepatocelular	hepatocelular	hepato-: liver (Mosby's Medical Dictionary, 2009).
carcinoma	carcinoma	carcin-: cancer (Mosby's Medical Dictionary, 2009). -oma: tumor; neoplasm. (Miller-Keane Encyclopedia and Dictionary of Medicine, 2003).

Table 5. Translation and meaning of Latin of Greek prefixes and suffixes.

4.4 THE USE OF ACRONYMS

Acronyms have a high rate of occurrence in medical texts and they are used to give brevity to long complex noun groups that need to be constantly repeated. According to Ordóñez (1992), if it is possible, acronyms should be translated into Spanish (see examples 1-5 in Table 6). Besides, Newmark (1988) asserts that if we are dealing with the translation of institutions or terms whose meaning can be unknown for the reader, the main point is not to translate the acronym, but to highlight the function of the institution or the meaning of the term (see example 6 on Table 6).

ENGLISH	SPANISH
1. HIV	VIH
2. anti-HCV	anti- VHC
3. RNA	ARN
4. CI	IC
5. HCV chronic hepatitis C virus	VHC infección crónica por el virus de la hepatitis C
6. NHANES (National Health and Nutrition Examination Survey)	NHANES (Encuesta Nacional de Examen de Salud y Nutrición)
7. RIBA (confirmatory recombinant immunoblot assay)	Ensayo confirmatorio immunoblot recombinante (RIBA)

Table 6. Translation of acronyms

4.5 BORROWINGS

ENGLISH	SPANISH
Qualitative determination of anti-HCV in blood serum or plasma was measured using direct solid-phase enzyme immunoassay with an anti-HCV screening chemi-luminescence immunoassay	Se evaluó la determinación cualitativa del anti- VHC en el suero sanguíneo o plasma utilizando un inmunoensayo enzimático en fase sólida directa mediante un inmunoanálisis quimioluminiscente para cribado de anti-VHC (sistema de inmunodiagnóstico VITROS,
Screening reactive specimens were then tested using a confirmatory recombinant immunoblot assay	Las muestras reactivas al cribado fueron entonces examinadas utilizando el ensayo confirmatorio inmunoblot recombinante
National data on prevalence are useful for the design of programs for HCV screening , linkage to care, and treatment.	Los datos nacionales de prevalencia son de ayuda para el diseño de programas de cribado del VHC asociados a la atención y el tratamiento.

Table 7. Borrowings

About the borrowings it is important to talk about a term that occurs constantly in the text: *screening*. As some other words ending with the “-ing particle”, sometimes they are not translated, as a sign of modernity and globalization (Gutierrez Rodilla, 1996). As it has been previously mentioned, this text is an expert-to-expert text, so both, the author and the reader have a similar level of expertise. According to this, *screening* should not be translated into Spanish. However, I have translated this word as “cribado” (see table 7 above) because this is the word that Spanish doctors use most of the time while they are working according to experts.

4.6 THE PASSIVE VOICE

The passive voice constantly appears in medical texts. In fact, according to Marsh (1996) passive structures are quite more common in English medical texts than in medical Spanish ones. These structures are usually translated into Spanish using a *pasiva refleja* (see Table 8), which is a type of passive voice that can be used with transitive verbs and that does not show who the performer of the action is. English passive voice can be also translated using the passive voice with the verb “ser (to be)”. Sometimes we decided to use also a passive in Spanish since we checked the corpus and found that, this use is predominant in the texts extracted from Spanish medical journals (see table 9).

Another type of passive in English is the “passive infinitive”. There is not an equivalent passive voice in Spanish so I have translated it using active voice acting as a relative clause (see table 10, example 1). There is a case (see table 10 example 2) in which I have translated a passive sentence in English by using the active voice in Spanish, to make the sentence sound more natural in the TT.

ENGLISH	SPANISH
serum samples from participants aged 6 years or older were tested for antibody to HCV.	se analizó los anticuerpos del VHC en muestras de suero de los participantes de al menos 6 años.
qualitative determination of anti-HCV in blood serum or plasma was measured	se evaluó la determinación cualitativa del antiVHC en el suero sanguíneo o plasma
49% of persons with HCV infection did not report either risk factor	en el 49% de las personas infectadas por el VHC no se encontró ninguno de los factores de riesgo.
however, many persons infected with HCV remain untested and unaware of their infection (...) are not captured in case-based surveillance	hin embargo, muchas personas infectadas por el VHC permanecen sin ser sujetas a examen e inconscientes de la infección (...) no se capturan en la vigilancia en el cribado

ENGLISH	SPANISH
participants were interviewed in their homes	se entrevistó a los participantes en sus respectivos domicilios
persons aged 16 years or older and emancipated minors were interviewed directly	se entrevistó directamente a las personas de 16 años o más y a menores de edad emancipados
qualitative determination of anti-HCV in blood serum or plasma was measured using direct solid-phase enzyme immunoassay	se evaluó la determinación cualitativa del anti- VHC en el suero sanguíneo o plasma utilizando un inmunoensayo enzimático en fase sólida directa mediante un inmunoanálisis quimioluminiscente para cribado de anti-VHC
these participants were considered to be never infected with HCV.	a estos participantes se les consideró como personas nunca infectadas por el VHC.
those who tested positive for anti-HCV but negative for HCV RNA (resolved infections; n = 90) and those who had no serum available for RNA testing (n = 51) were not included in our analyses	en los análisis no se incluyó a aquellos que tuvieron el anti-VHC positivo pero el ARN VHC negativo (infecciones resueltas; n=90) y a aquellos que no tenían el suero disponible para la prueba de ARN (n=51)
serum samples that were confirmed positive or indeterminate for anti-HCV were further tested for HCV RNA	las muestras de suero que se evaluó como positivas o indeterminadas para el anti-VHC fueron posteriormente sometidas a una prueba para el ARN VHC
of the 43 898 persons aged 6 years or older sampled in NHANES between 2003 and 2010, a total of 34 039 (77.5%) were interviewed and 32 791 (96.3% of those interviewed) were examined .	de las 43 898 personas de 6 o más años de edad de la muestra de NHANES entre 2003 y 2010, se entrevistó a un total de 34 039 (77,5%) y se examinó a 32.791 (el 96,3% de aquellos entrevistados).

ENGLISH	SPANISH
serum samples were available for anti-HCV testing for 30 074 persons (91.7% of those examined)	Se disponía de muestras de suero para la prueba de anti-VHC para 30.074 personas (91,7% de las personas examinadas).
among the 30 114 persons aged 20 years or older sampled in NHANES between 2003 and 2010, a total of 22 173 (73.6%) were interviewed and 21 281 (96.0% of those interviewed) were examined.	entre las 30 114 personas de 20 o más años de edad registradas en NHANES entre 2003 y 2010, se entrevistó a un total de 22 173 (73,6%) y se examinó a 21 281 (el 96,0% de aquellos entrevistados)
serum samples were available for anti-HCV testing for 20042 persons (94.2% of those examined)	se disponía de muestras de suero para la prueba de anti-VHC para 20042 personas (94,2% de las examinadas)

Table 8. Translation of passives to *pasiva refleja*

ENGLISH	SPANISH
those with indeterminate results were reported as indeterminate	aquellas con resultados imprecisos fueron descritas como indeterminadas.
screening reactive specimens were then tested using a confirmatory recombinant immunoblot assay (RIBA) (RIBA HCV 3.0 Strip Immunobot Assay, Chiron, Emeryville, California)	las muestras reactivas al cribado fueron entonces examinadas utilizando el ensayo confirmatorio inmunoblot recombinante (RIBA) (técnica de inmunoblotting en tira 3.0o RIBA-VHC, Chiron, Emeryville, California)

ENGLISH	SPANISH
<p>samples with positive results on RIBA testing were reported as confirmed positive for anti-HCV, those with results that were negative were reported as negative for anti-HCV, and those with indeterminate results were reported as indeterminate.</p>	<p>las muestras con resultados positivos en las pruebas RIBA fueron descritas como positivos confirmados para anti-VHC, aquellas con resultados negativos fueron descritas como negativas para anti-VHC, y aquellas con resultados imprecisos fueron descritas como indeterminadas.</p>
<p>these estimates do not include cases of chronic HCV not captured by NHANES</p>	<p>estas estimaciones no incluyen los casos de infección crónica por VHC que no fueron recopilados por NHANES</p>
<p>serum samples that were confirmed positive or indeterminate for anti-HCV were further tested for HCV RNA</p>	<p>las muestras de suero que se evaluó como positivas o indeterminadas para el anti-VHC fueron posteriormente sometidas a una prueba para el ARN VHC</p>
<p>we considered persons to have chronic HCV infection if results of their test for anti-HCV were confirmed positive or indeterminate and results of their test for HCV RNA were positive.</p>	<p>consideramos que las personas tenían la infección crónica por VHC si los resultados de las pruebas para el anti-VHC eran confirmados como positivos o indeterminados y los resultados de las pruebas para el ARN VHC fueron positivos.</p>
<p>homeless and incarcerated persons were not surveyed.</p>	<p>los indigentes y los reclusos no han sido evaluados.</p>
<p>no more than one half of persons with chronic HCV infection have been tested for anti-HCV</p>	<p>(...) no más de la mitad de personas con infección crónica del VHC han sido sujetas a un análisis de anti-VHC;</p>

Table 9. Translation of passives to passive with the verb “ser”

ENGLISH	SPANISH
<p>we considered persons to have chronic HCV infection if results of their test for anti-HCV were confirmed positive or indeterminate and results of their test for HCV RNA were positive.</p>	<p>consideramos que las personas tenían la infección crónica por VHC si los resultados de las pruebas para el anti-VHC eran confirmados como positivos o indeterminados y los resultados de las pruebas para el ARN VHC fueron positivos.</p>
<p>incarcerated and homeless persons were not surveyed</p>	<p>personas reclusas o sin techo no participaron en el sondeo</p>

Table 10. Translation of passives to active voice

4.7 NOMINAL GROUPS

According to Gillett (2009), nominal groups or noun-based sentences, as well as nouns, are more common in formal written English than in other structures, such as verbs. Every nominal group in English is formed by a head and elements that modify this head (premodifiers). We can deal with pre-modification, where the head of the nominal group is at the end of it, or postmodification, when the head is the first word of the nominal group and the modifiers are placed after it, such is the case of Spanish. By analyzing my translation (see Table 11) we can notice that Spanish is a left-headed language, due to almost always the modifiers are placed after the head of the nominal group. However, we can also realize that English is a right-headed language because the head of the nominal group is premodified.

ENGLISH	SPANISH
additional serum available for HCV RNA testing	suero adicional para la prueba de ARN VHC
all-cause mortality	mortalidad por cualquier causa
anti-HCV screening chemi-luminescence immunoassay	inmunoanálisis quimioluminiscente para cribado de anti-VHC
antiviral therapy	terapia antiviral
at-risk populations	poblaciones de mayor riesgo
blood transfusion	transfusion de sangre
case-based surveillance	vigilancia en el cribado
Centers for Disease Control and Prevention's National Center for Health Statistics	Centros para el Control y la Prevención de Enfermedades del Centro Nacional de Estadísticas de la Salud
chronic hepatitis C virus (HCV) infection	infección crónica por el virus de la hepatitis C (VHC)
chronic infection	infección crónica
clinical practice	práctica clínica
Computer-Assited Personal Interviewing system	sistema de Entrevista Personal Asistida por Computadora

ENGLISH	SPANISH
confirmatory test	prueba de confirmación
confirmatory recombinant immunoblot assay	ensayo confirmatorio inmunoblot recombinante
decompensated cirrhosis	cirrosis descompensada
direct solid-phase enzyme immunoassay with an anti-HCV screening chemiluminescence immunoassay	inmunoensayo enzimático en fase sólida directa mediante un inmunoanálisis quimioluminiscente para cribado de anti-VHC
estimated prevalence of chronic HCV infection	prevalencia estimada de la infección crónica por el VHC
estimation of overall anti-HCV prevalence	estimación de la prevalencia global del anti-VHC
false-positive results	resultados falsos positivos
health burden	carga sanitaria
health care system	sistema de atención sanitaria
hepatocellular carcinoma	carcinoma hepatocelular
in case-based surveillance	vigilancia en el cribado de casos
infected persons	personas infectadas
in vitro qualitative immunoassay	inmunoensayo cualitativo in vitro
in vitro nucleic acid amplification test	prueba de amplificación de los ácidos nucleicos in vitro
laboratory testing	análisis de laboratorio
liver cancer	cáncer de hígado
lower family income	renta familiar baja
medical care	atención médica
Mobile Examination Center	Centro Móvil de Asistencia Sanitaria
National Center for Health Statistics Institutional Review Board	Consejo de Revisión Institucional del Centro Nacional de Estadísticas de la Salud

ENGLISH	SPANISH
National Health and Nutrition Examination Survey	Encuesta Nacional de Examen de Salud y Nutrición
physical examinations	exploraciones físicas
policy planning	planificación de políticas
positive results on RIBA testing	resultados positivos en las pruebas RIBA
possible risks	posibles riesgos
primary Funding Source	principal fuente de financiación
programs for HCV screening, linkage to care, and treatment	programas de cribado del VHC asociados a la atención y el tratamiento
quantitation of HCV RNA	determinación cuantitativa del ARN VHC
resolved infections	infecciones resueltas
risk factors	factores de riesgo
sampling design	muestreo
serum specimens	muestras de suero
serum samples	muestras de suero
standardized interviews	entrevistas estandarizadas
successful treatment	tratamiento exitoso
surveillance purposes	fines de vigilancia
survey estimates of persons	estimaciones de las encuestas de las personas
survey design for NHANES	diseño de encuestas para NHANES
sustained virologic response indicative of cure	una respuesta viral sostenida indicativa de la curación
tests of biological samples	pruebas de muestras biológicas
the estimated prevalence of anti-HCV	la prevalencia estimada de anti-VHC
typically asymptomatic	generalmente asintomáticas

ENGLISH	SPANISH
VITROS Anti-HCV Immunodiagnostic System	Sistema de inmunodiagnóstico VITROS
written informed consent	consentimiento informado por escrito

Table 11. Translation of nominal groups

5. CONCLUSIONS

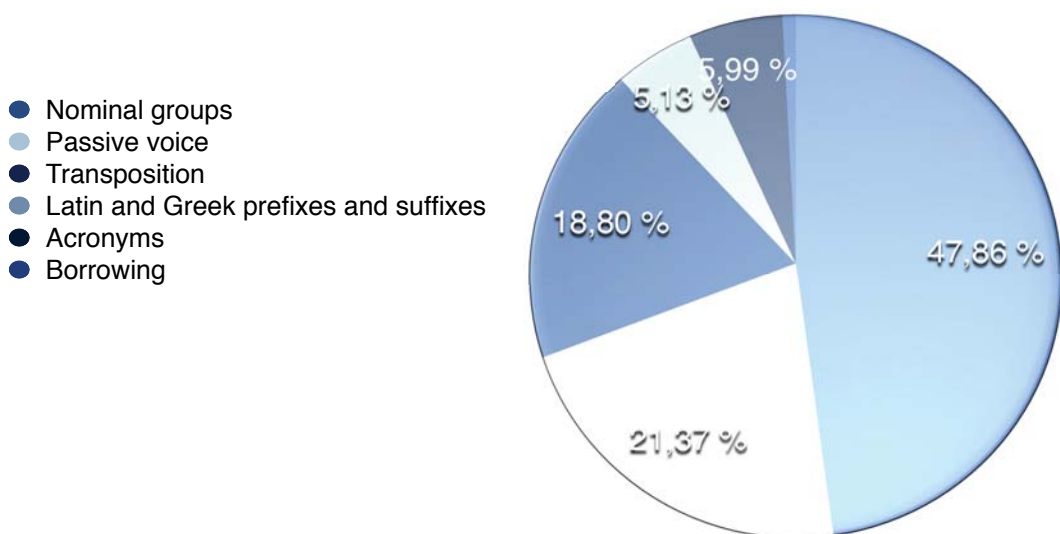
After having analyzed all the results we finally know what the most and less common structures are in medical research papers. The following graphics show a classification of the total amount of structures translated.

Translated structures	Nominal groups	Passive voice	Transpositions	Acronyms	Latin and Greek prefixes and suffixes:	Borrowings
Quantity	56	25	22	7	6	1

Table 12. Number of appearance of each structure

As it is shown in the table above, there is a clear predominance of nominal groups, followed by the passive voice and transpositions. Acronyms and Latin and Greek prefixes and suffixes have a high rate of use but they are not so common as the structures mentioned before. We can also observe that borrowings are the less-used structure. All of this is clearly shown by the percentages in the graphic below:

Graphic 1. Percentage of each of appearance of each structure

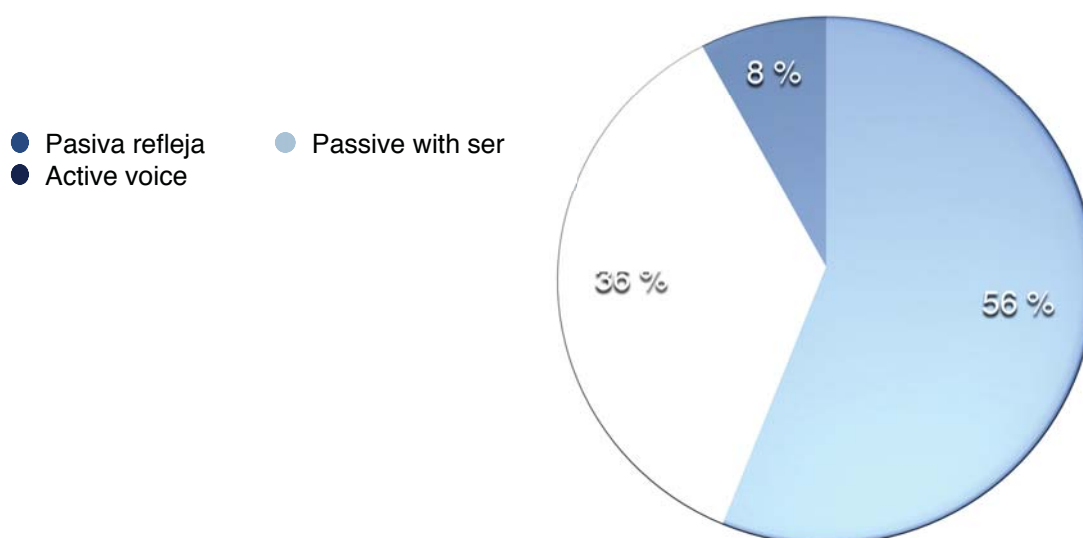


Regarding the passive voice, we can observe that the *pasiva refleja* is the structure mostly used when translating a passive structure in a research paper. Passive voice using the verb “ser” is also frequent and the less-used option is the transition from passive to active voice. The number of times that each resource has been used in my translation is shown in the table below and the percentages can be seen in graphic 2.

Type of passive	Pasiva refleja	Passive with <i>ser</i>	Active voice
Quantity	56	25	22

Table 13. Times that the structure was used to translate passive voice

Graphic 2. Percentage of each of the structures used to translate passive voice



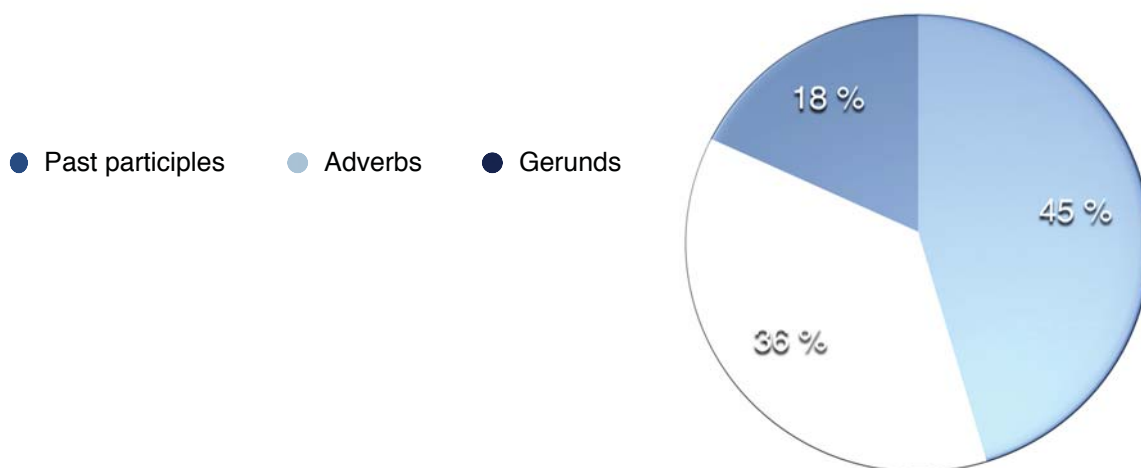
As far as transpositions are concerned, it has been observed that the structures that have been most frequently used as transpositions are past participles. It is quite common to use transpositions in order to translate adverbs. Transpositions are also useful to translate gerunds but their rate of use is less than past participles or adverbs. The times

that each of these three previous forms have been used as transpositions is shown in table number 14 and the percentages can be seen in the graphic below:

Type of structure	Past participles	Adverbs	Gerunds
Quantity	10	8	4

Table 14. Times that the structure was translated by using transposition.

Graphic 3. Percentage of each structure translated by using transposition.



In conclusion, we can determine that nominal groups, passives and transpositions are the most recurrent translation techniques when dealing with the translation of a medical research paper.

Further research can be conducted for example on the use of these previous three translation techniques in other registers of the medical language, such as the didactic and the popularized ones so as to check their frequency of occurrence when translating texts belonging to these two communicative contexts. These techniques could also be collected in a translation manual that might help medical translators, doctors and other experts.

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Medical research paper

Denniston, M. M., Jiles, R. B., Drobeniuc, J., Klevens, R. M., Ward, J. W., McQuillan, G. M., & Holmberg, S. D. (2014). Chronic hepatitis C virus infection in the United States, national health and nutrition examination survey 2003 to 2010. *Annals of internal medicine*, 160(5), 293-300.

APPENDIX

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<p>Annals of Internal Medicine</p> <p>Original Research</p> <p>Chronic Hepatitis C Virus Infection in the United States, National Health and Nutrition Examination Survey 2003 to 2010.</p> <p>Maxine M. Denniston, MSPH; Ruth B. Jiles, PhD, MS, MPH; Jan Drobeniuc, MD, PhD; R. Monina Klevens, DDS, MPH; John W. Ward, MD; Geraldine M. McQuillan, PhD; and Scott D. Holmberg, MD, MPH</p> <p>Background: Knowledge of the number of persons with chronic hepatitis C virus (HCV) infection in the United States is critical for public health and policy planning.</p> <p>Objective: To estimate the prevalence of chronic HCV infection between 2003 and 2010 and to identify factors associated with this condition.</p> <p>Design: Nationally representative household survey.</p> <p>Setting: U.S. noninstitutionalized civilian population.</p> <p>Participants: 30 074 NHANES (National Health and Nutrition Examination Survey) participants between 2003 and 2010.</p> <p>Measurements: Interviews to ascertain demographic characteristics and possible risks and exposures for HCV infection. Serum samples from participants aged 6 years or older were tested for antibody to HCV; if results were positive or indeterminate, the samples were tested for HCV RNA, which indicates current chronic infection.</p>	<p>Annals of Internal Medicine</p> <p>Investigación Original</p> <p>Infección Crónica por el Virus de la Hepatitis C en Estados Unidos, Encuesta Nacional del Examen de Salud y Nutrición desde el año 2003 hasta 2010.</p> <p>Maxine M. Denniston, MSPH; Ruth B. Jiles, PhD, MS, MPH; Jan Drobeniuc, MD, PhD; R. Monina Klevens, DDS, MPH; John W. Ward, MD; Geraldine M. McQuillan, PhD; and Scott D. Holmberg, MD, MPH</p> <p>Antecedentes: El conocimiento del número de personas con infección crónica por el virus de la hepatitis C (VHC) en Estados Unidos es crucial para la salud pública y para la planificación de políticas.</p> <p>Objetivo: Estimar la prevalencia de la infección crónica por el VHC entre 2003 y 2010 e identificar los factores que se asocian a dicha enfermedad.</p> <p>Diseño: Encuesta a familias representativas a nivel nacional.</p> <p>Ambiente: Población civil estadounidense no institucionalizada.</p> <p>Participantes: 30074 participantes en la NHANES (Encuesta Nacional de Examen de Salud y Nutrición) entre los años 2003 y 2010.</p> <p>Medidas: Entrevistas para determinar las características demográficas y los posibles riesgos y exposiciones a la infección por el VHC. Se analizaron los anticuerpos del VHC en muestras de suero de los participantes de al menos 6 años; si los resultados eran positivos o indeterminados, las muestras se analizaban para el ARN del VHC, lo que indica una infección crónica actual.</p>

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<p>Results: Based on 273 participants who tested positive for HCV RNA, the estimated prevalence of HCV infection was 1.0% (95%CI, 0.8% to 1.2%), corresponding to 2.7 million chronically infected persons (CI, 2.2 to 3.2 million persons) in the U.S. noninstitutionalized civilian population. Infected persons were more likely to be aged 40 to 59 years, male, and non-Hispanic black and to have less education and lower family income. Factors significantly associated with chronic HCV infection were illicit drug use (including injection drugs) and receipt of a blood transfusion before 1992; 49% of persons with HCV infection did not report either risk factor.</p> <p>Limitation: Incarcerated and homeless persons were not surveyed.</p> <p>Conclusion: This analysis estimated that approximately 2.7 million U.S. residents in the population sampled by NHANES have chronic HCV infection, about 500 000 fewer than estimated in a similar analysis between 1999 and 2002. These data underscore the urgency of identifying the millions of persons who remain infected and linking them to appropriate care and treatment.</p> <p>Primary Funding Source: None.</p> <p>Hepatitis C virus (HCV) infection is a treatable but underrecognized and underdiagnosed disease. An estimated 130 to 170 million persons, 2% to 3% of the world's population, are living with HCV infection, and almost 500 000 persons die of HCV-related conditions each year (primarily decompensated cirrhosis and liver cancer) (1).</p>	<p>Resultados: Basándonos en los 273 participantes que obtuvieron resultados positivos en la prueba del ARN del VHC, se estima que la prevalencia de la infección por el VHC es de 1.0% (95%IC: 0,8 a 1,2), que se corresponde con los 2,7 millones de personas infectadas de manera crónica (IC, 2,2 a 3,2 millones de personas) entre la población estadounidense no institucionalizada. Las personas infectadas suelen encontrarse entre los 40 y los 59 años de edad, ser varones, personas de color no hispanas, poco cualificadas y con renta familiar baja. Los factores asociados de forma significativa a la infección crónica por el VHC son el consumo ilícito de drogas (incluyendo drogas inyectadas) o haber recibido una transfusión sanguínea antes de 1992; en el 49% de las personas infectadas por el VHC no se encontró ninguno de los factores de riesgo.</p> <p>Limitaciones: Personas reclusas o sin techo no participaron en el sondeo.</p> <p>Conclusión: Este análisis estima que aproximadamente 2,7 millones de residentes en Estados Unidos de la población de la muestra de NHANES tienen infección por elVHC, sobre 500.000 menos que los estimados en un análisis similar realizado entre 1999 y 2002. Estos datos enfatizan la urgencia de identificar a las millones de personas que permanecen infectadas y de vincularlos los cuidados y tratamientos apropiados.</p> <p>Principal fuente de financiación: Ninguna.</p> <p>La infección del virus de la hepatitis C (VHC) es una enfermedad tratable pero muy poco reconocida y diagnosticada. Se estima que entre 130 y 170 millones de personas, del 2% al 3% de la población mundial, vive con la infección por el VHC, y casi 500.000 personas mueren cada año por las complicaciones relacionadas con dicha enfermedad (principalmente de cirrosis descompensada y de cáncer de hígado) (1).</p>

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In the United States, previous estimates have consistently indicated that approximately 3 million or more persons have chronic HCV infection.

An analysis of 21 241 serum specimens from participants in NHANES (National Health and Nutrition Examination Survey), which provides nationally representative statistics on the health of the U.S. noninstitutionalized civilian population, indicated that 2.7 million persons (95% CI, 2.4 to 3.0 million persons) had chronic HCV infection between 1988 and 1994 (2). A similar analysis of 15 079 NHANES specimens between 1999 and 2002 estimated that 3.2 million persons (95% CI, 2.7 to 3.9 million persons) had chronic HCV infection (3). These estimates do not include cases of chronic HCV not captured by NHANES, notably among homeless persons and persons who were incarcerated during the survey (4).

The Institute of Medicine recently concluded that it is essential to know the dimensions and direction of this epidemic, which has major implications for health burden and costs for the United States (5). Current treatments can cure HCV in a substantial proportion of persons who complete therapy, thereby decreasing the risk for hepatocellular carcinoma and all- cause mortality.

However, many persons infected with HCV remain untested and unaware of their infection, are unknown to the health care system, and are not captured in case-based surveillance because they are typically asymptomatic (6). Deaths among persons with HCV infection have superseded deaths in those with HIV infection (7).

Estimaciones previas en Estados Unidos indican de forma consistente que aproximadamente 3 millones de personas o más están infectadas por el VHC.

Un análisis de 21.241 muestras de suero de participantes en la NHANES (Encuesta nacional de examen de salud y nutrición), que proporciona estadísticas nacionalmente representativas de la salud de la población civil estadounidense no institucionalizada, indica que 2,7 millones de personas (95%IC: 2,4 a 3 millones de personas) tuvieron unainfección crónica por el VHC entre 1988 y 1994 (2). Un análisis similar realizado por NHANES entre 1999 y 2002 con 15.079 muestras estimó que 3,2 millones de personas (95%IC: 2,7 a 3,9 millones de personas) tuvieron una infección por el VHC (3). Estas estimaciones no incluyen los casos de infección crónica por VHC que no fueron recopilados por NHANES, especialmente entre las personas sin hogar y las que estaban reclusas durante la encuesta (4).

El Instituto de Medicina ha concluido recientemente que es esencial conocer las dimensiones y la dirección de esta epidemia, que tiene consecuencias importantes para la carga sanitaria y para los gastos de Estado Unidos (5). Los tratamientos actuales pueden curar el VHC en una proporción significativa de las personas que completan la terapia, así se disminuye el riesgo de carcinoma hepatocelular y la mortalidad por cualquier causa.

Sin embargo, muchas personas infectadas por el VHC permanecen sin ser sujetas a examen e inconscientes de la infección, son desconocidas para el sistema de atención sanitaria, y no se capturan en la vigilancia en el cribado de casos porque generalmente son asintomáticas (6). Las muertes entre las personas con la infección por el VHC han superado las de aquellas personas que padecen la infección por el VIH (7).

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<p>Surveillance for antibody to HCV (anti-HCV) and HCV RNA has been part of NHANES since the 1980s, although RNA testing for NHANES III was done retrospectively. Surveillance through such a large national survey presents the best measurement of the prevalence of anti-HCV and chronic HCV infection in the general U.S. population. Accordingly, using methods similar to analyses from 20 and 10 years ago (2, 3), we analyzed data from participants in NHANES between 2003 and 2010 to estimate the prevalence of HCV infection and to determine risk factors and exposures associated with chronic infection.</p> <p>METHODS</p> <p>Survey Design</p> <p>The National Health and Nutrition Examination Survey, conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics, collects nationally representative data on the health and nutritional status of the U.S. noninstitutionalized civilian population. This survey uses a complex, stratified, multistage probability sampling design and collects information from approximately 5000 persons annually using standardized interviews, physical examinations, and tests of biological samples. Participants were interviewed in their homes using the Computer-Assisted Personal Interviewing system to ascertain demographic characteristics and in the Mobile Examination Center to ascertain possible risks and exposures for HCV infection.</p>	<p>La vigilancia de los anticuerpos del VHC (anti- VHC) y del ARN del VHC ha formado parte de NHANES desde la década de los 80 aunque el ARN analizado para la tercera NHANES se hizo de forma retrospectiva. La vigilancia a través de este un muestreo nacional tan amplio como este presenta la mejor medida de prevalencia de anti-VHC e infección crónica del VHC en la población general de Estados Unidos. En consecuencia, utilizando métodos similares a los análisis de hace 20 o 10 años (2, 3) analizamos la información de los participantes en NHANES entre 2003 y 2010 para estimar la prevalencia de la infección del VHC y para determinar los factores de riesgo y las exposiciones que se asocian a la infección crónica.</p> <p>MÉTODOS</p> <p>Diseño de la encuesta</p> <p>La Encuesta Nacional de Examen de Salud y Nutrición dirigida por los Centros para el Control y la Prevención de Enfermedades del Centro Nacional de Estadísticas de la Salud, recopila información específica sobre la salud a nivel nacional y la nutrición de la población civil estadounidense no insitucionalizada. Esta encuesta utiliza un muestreo probabilístico complejo, estratificado y multietapa y recopila información de aproximadamente 5000 personas anualmente utilizando entrevistas estandarizadas, exploraciones físicas y pruebas de muestras biológicas. Se entrevistó a los participantes en sus respectivos domicilios utilizando el sistema de Entrevista Personal Asistida por Computadora para determinar las características demográficas, y en el Centro Móvil de Asistencia Sanitaria para determinar posibles riesgos y exposiciones de la infección causada por el VHC.</p>

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<p>Persons aged 16 years or older and emancipated minors were interviewed directly; an adult proxy provided information for participants younger than 16 years and for persons unable to answer the questions themselves. All participants provided written informed consent. More detailed information on survey design for NHANES, including approval from the National Center for Health Statistics Institutional Review Board (Hyattsville, Maryland), is available from the survey documentation at www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm.</p> <p><u>Laboratory Testing</u></p> <p>Qualitative determination of anti-HCV in blood serum or plasma was measured using direct solid-phase enzyme immunoassay with an anti-HCV screening chemi-luminescence immunoassay (VITROS Anti-HCV Immunodiagnostic System, Ortho Clinical Diagnostics, Rochester, New York). Screening reactive specimens were then tested using a confirmatory recombinant immunoblot assay (RIBA) (RIBA HCV 3.0 Strip Immunobot Assay, Chiron, Emeryville, California), an in vitro qualitative immunoassay for the detection of anti-HCV in human serum or plasma. Samples with positive results on RIBA testing were reported as confirmed positive for anti-HCV, those with results that were negative were reported as negative for anti-HCV, and those with indeterminate results were reported as indeterminate.</p>	<p>Se entrevistó directamente a las personas de 16 años o más y a menores de edad emancipados; un representante adulto facilitó la información de los los participantes menores de 16 años y de las las personas incapaces de responder las preguntas por sí mismos. Todos los participantes proporcionaron un consentimiento informado por escrito. Está disponible más información detallada del diseño de encuestas para NHANES, incluyendo el consentimiento del Consejo de Revisión Institucional del Centro Nacional de Estadísticas de la Salud (Hyattsville, Maryland) en la documentación de la encuesta en www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm.</p> <p><u>Análisis de laboratorio</u></p> <p>Se evaluó la determinación cualitativa del anti-VHC en el suero sanguíneo o plasma utilizando un inmunoensayo enzimático en fase sólida directa mediante un inmunoanálisis quimioluminiscente para cribado de anti-VHC (sistema de inmunodiagnóstico VITROS, Ortho Clinical Diagnostics, Rochester, Nueva York). Las muestras reactivas al cribado fueron entonces examinadas utilizando el ensayo confirmatorio inmunoblot recombinante (RIBA) (técnica de inmunoblotting en tira 3.0 RIBA-VHC, Chiron, Emeryville, California), un inmunoensayo cualitativo in vitro para la detección del antígeno C en el suero sanguíneo o plasma humano. Las muestras con resultados positivos en las pruebas RIBA fueron descritas como positivos confirmados para anti-VHC, aquellas con resultados negativos fueron descritas como negativas para anti-VHC, y aquellas con resultados imprecisos fueron descritas como indeterminadas.</p>

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In clinical practice, it is most important to identify persons who are currently infected; however, for surveillance purposes, we are interested in having a reliable measure of both those who are currently infected and those who were ever infected. Although the sensitivity and specificity of anti-HCV tests have improved over time for at-risk populations, estimating the true prevalence in a low-risk, low-prevalence population, such as that sampled in NHANES, requires a confirmatory test, such as RIBA, to eliminate false-positive results from our estimates of persons ever infected. Serum samples that were confirmed positive or indeterminate for anti-HCV were further tested for HCV RNA using an in vitro nucleic acid amplification test for the quantitation of HCV RNA in human serum or plasma.

We used the COBAS AMPLICOR HCV Test, version 2.0 (Roche Diagnostics, Indianapolis, Indiana), on the COBAS AMPLICOR Analyzer (Roche Diagnostics) for samples from 2005 to 2010 and the COBAS AmpliPrep/ TaqMan HCV Test, version 2 (Roche Diagnostics), on the COBAS TaqMan 48 Analyzer (Roche Diagnostics) for samples from 2003 to 2004.

We considered persons to have chronic HCV infection if results of their test for anti-HCV were confirmed positive or indeterminate and results of their test for HCV RNA were positive. Our comparison group comprised persons who tested negative for anti-HCV; these participants were considered to be never infected with HCV. Those who tested positive for anti-HCV but negative for HCV RNA (resolved infections; n = 90) and those who had no serum available for RNA testing (n = 51) were not included in our analyses, except for estimation of overall anti-HCV prevalence, because we wanted to focus on chronic HCV infection.

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En la práctica clínica, es más importante identificar a las personas que actualmente están infectadas; sin embargo, para fines de vigilancia, estamos interesados en obtener una medida fiable de ambos, para aquellos que están infectados actualmente y para aquellos que nunca lo han estado. Aunque la sensibilidad y especificidad de las pruebas del anti-VHC han mejorado con el paso del tiempo en las poblaciones de mayor riesgo, la estimación de la verdadera prevalencia en una población de bajo riesgo, baja prevalencia, como la que se muestra en NHANES, requieren una prueba de confirmación, como por ejemplo RIBA, para eliminar los resultados falsos positivos de nuestra evaluación de las personas que nunca han estado infectadas. Las muestras de suero que se evaluó como positivas o indeterminadas para el anti-VHC fueron posteriormente sometidas a una prueba para el ARN VHC mediante una prueba de amplificación de los ácidos nucleicos in vitro para la determinación cuantitativa del ARN VHC en el suero humano o plasma humanos.

Empleamos un instrumento automático de pruebas de sonda de DNA, el denominado COBAS AMPLICOR versión 2.0 (Diagnóstico Roche, Indianapolis, Indiana), en el analizador COBAS AMPLICOR (Diagnóstico Roche) para muestras del 2005 al 2010 y el test PCR de doble diana COBAS AmpliPrep/COBAS TaqMan HIV, versión 2 (Diagnóstico Roche), en el analizador COBAS TaqMan 48 (Diagnóstico Roche) para muestras del 2003 al 2004.

Consideramos que las personas tenían la infección crónica por VHC si los resultados de las pruebas para el anti-VHC eran confirmados como positivos o indeterminados y los resultados de las pruebas para el ARN VHC fueron positivos. Nuestro grupo comparativo constaba de aquellas personas que tuvieron el anti-VHC negativo; a estos participantes se les consideró como personas nunca infectadas por el VHC. En los análisis no se incluyó a aquellos que tuvieron el anti-VHC positivo pero el ARN VHC negativo (infecciones resueltas; n=90) y a aquellos que no tenían el suero disponible para la prueba de ARN (n=51), excepto para la estimación de la prevalencia global del anti-VHC, ya que queríamos centrarnos en la infección crónica por VHC.

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<p data-bbox="252 297 352 327">Context</p> <p data-bbox="252 360 780 613">Chronic hepatitis C virus (HCV) infection is an important public health issue. Using data from a U.S. household survey conducted between 2003 and 2010, the authors compared the estimated prevalence of chronic HCV infection and risk factors for infection with those from earlier periods.</p> <p data-bbox="252 647 405 676">Contribution</p> <p data-bbox="252 710 780 869">The estimated prevalence of chronic HCV infection in the United States has decreased. Risk factors are essentially unchanged from previous periods and were reported by only about one half of infected persons.</p> <p data-bbox="252 902 349 931">Caution</p> <p data-bbox="252 965 780 1030">Homeless and incarcerated persons were not surveyed.</p> <p data-bbox="252 1064 392 1093">Implication</p> <p data-bbox="252 1126 780 1285">The burden of chronic HCV infection in the United States is substantial. National data on prevalence are useful for the design of programs for HCV screening, linkage to care, and treatment.</p> <p data-bbox="252 1319 379 1348">RESULTS</p> <p data-bbox="252 1382 780 1765">Of the 43 898 persons aged 6 years or older sampled in NHANES between 2003 and 2010, a total of 34 039 (77.5%) were interviewed and 32 791 (96.3% of those interviewed) were examined. Serum samples were available for anti-HCV testing for 30 074 persons (91.7% of those examined). Of these, 386 tested positive for anti-HCV and, of those who had additional serum available for HCV RNA testing (approximately 86%), 273 tested positive for HCV RNA.</p>	<p data-bbox="798 297 908 327">Contexto</p> <p data-bbox="798 360 1358 613">La infección crónica por el virus de la hepatitis C (VHC) es un asunto de salud pública importante. Los autores compararon la prevalencia estimada de la infección crónica por el VHC y los factores de riesgo para la infección con aquellos de periodos anteriores, utilizando la información de una encuesta de hogares estadounidenses dirigida entre 2003 y 2010.</p> <p data-bbox="798 647 932 676">Aportación</p> <p data-bbox="798 710 1358 882">La prevalencia estimada de la infección crónica por el VHC ha disminuido en los Estados Unidos. Los factores de riesgo no han variado con respecto a periodos anteriores y se han descrito solo en alrededor de la mitad de las personas infectadas.</p> <p data-bbox="798 916 943 945">Advertencia</p> <p data-bbox="798 978 1358 1030">Los indigentes y los reclusos no han sido evaluados.</p> <p data-bbox="798 1064 963 1093">Consecuencia</p> <p data-bbox="798 1126 1358 1285">La carga de la infección crónica por el VHC es significativa en los Estados Unidos. Los datos nacionales de prevalencia son de ayuda para el diseño de programas de cribado del VHC asociados a la atención y el tratamiento.</p> <p data-bbox="798 1319 984 1348">RESULTADOS</p> <p data-bbox="798 1382 1358 1765">De las 43 898 personas de 6 o más años de edad de la muestra de NHANES entre 2003 y 2010, se entrevistó a un total de 34 039 (77,5%) y se examinó a 32 791 (el 96,3% de aquellos entrevistados). Se disponía de muestras de suero para la prueba de anti-VHC para 30 074 personas (91,7% de las personas examinadas). De ellas, 386 tuvieron el anti-VHC positivo y, de aquellas que tenían disponible suero adicional para la prueba de ARN VHC (aproximadamente el 86%), 273 tuvieron el ARN VHC positivo.</p>

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<p>Among the 30 114 persons aged 20 years or older sampled in NHANES between 2003 and 2010, a total of 22 173 (73.6%) were interviewed and 21 281 (96.0% of those interviewed) were examined. Serum samples were available for anti-HCV testing for 20042 persons (94.2% of those examined). Of these, 381 tested positive for anti- HCV; of those who had additional serum available for HCV RNA testing (approximately 87%), 271 tested positive for HCV RNA.</p>	<p>Entre las 30 114 personas de 20 o más años de edad registradas en NHANES entre 2003 y 2010, se entrevistó a un total de 22 173 (73,6%) y se examinó a 21 281 (el 96,0% de aquellos entrevistados). Se disponía de muestras de suero para la prueba de anti-VHC para 20042 personas (94,2% de las examinadas). De ellas, 381 tuvieron el anti-VHC positivo; de aquellas que tenían disponible suero adicional para la prueba de ARN VHC (aproximadamente el 87%), 271 tuvieron el ARN VHC positivo.</p>
<p>The estimated prevalence of anti-HCV among persons aged 6 years or older was 1.3% (95% CI, 1.2% to 1.5%), corresponding to approximately 3.6 million persons (CI, 3.0 to 4.2 million persons) with past or current HCV infection in the general U.S. population. The estimated prevalence of HCV RNA among those aged 6 years or older was 1.0% (CI, 0.8% to 1.2%), corresponding to approximately 2.7 million persons (CI, 2.2 to 3.2 million persons) with chronic (current) HCV infection in the general U.S. population.</p>	<p>La prevalencia estimada de anti-VHC en personas de 6 o más años era del 1,3% (95% IC; 1,2% a 1,5%), lo que corresponde aproximadamente a 3,6 millones de personas (IC, 3,0 a 4,2 millones de personas) con infección pasada o actual por el VHC en la población general de Estados Unidos. La prevalencia estimada de ARN VHC entre las personas de 6 o más años era del 1,0% (IC, 0,8 a 1,2) los que se corresponde aproximadamente con 2,7 millones de personas (IC, 2,2 a 3,2 millones de personas) con infección crónica (actual) dentro de la población general de Estados Unidos.</p>
<p>DISCUSSION</p>	<p>DISCUSIÓN</p>
<p>Using NHANES data from 2003 to 2010, we estimated that 1.3% of persons in the general U.S. population, or about 3.6 million (CI, 3.0 to 4.2 million persons), had anti-HCV indicative of past or current infection with HCV and that 1.0% of persons in the general population, or about 2.7 million (CI, 2.2 to 3.2 million persons), have chronic HCV infection (that is, are HCV RNA-positive). Our analysis of recent survey data may suggest a decrease in NHANES-estimated anti-HCV prevalence from 1.8% between 1988 and 1994 (2) and 1.6% between 1999 and 2002 (3).</p>	<p>Si utilizamos los datos de NHANES desde 2003 hasta 2010, estimamos que el 1,3% de la personas de la población general de Estados Unidos, o aproximadamente 3,6 millones (IC 3,0 a 4,2 millones) de personas, tenían anti VHC lo que indica una infección pasada o actual del por el VHC, y que el 1% de personas de la población general, o aproximadamente 2,7 millones (IC, 2,2 a 3,2 millones de personas) tienen infección crónica por el VHC (esto es, que son ARN VHC positivos). Nuestro análisis de los datos de la encuesta reciente puede sugerir una disminución desde el 1,8% entre 1988 y 1994 (2) al 1,6% entre 1999 y 2002 (3) en la prevalencia de anti-VHC estimada por NHANES.</p>

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<p>As previously assessed using NHANES, approximately 3.9 million persons (CI, 3.1 to 4.8 million persons) between 1988 and 1994 (2) and 4.1 million (CI, 3.4 to 4.9 million persons) between 1999 and 2002 were ever infected with HCV (anti-HCV-positive) (3). Our findings also suggest a possible decrease in chronic HCV infection from 1.3%, or 3.2 million persons (CI, 2.7 to 3.9 million persons), between 1999 and 2002 (3) (Figure). However, because of overlap in the 95% CIs of the survey estimates of persons who ever had HCV infection or chronic infection, any differences may represent the variability around estimates computed from a sample of the civilian noninstitutionalized U.S. population.</p> <p>Although increased successful treatment of HCV infection might also cause a decrease in prevalence estimates since the last survey, all available current information indicates that no more than one half of persons with chronic HCV infection have been tested for anti-HCV; many who are anti-HCV-positive do not receive medical care or confirmatory HCV RNA testing; and, if positive, few to date have received antiviral therapy and achieved sustained virologic response indicative of cure (6, 12–14). Thus, differences in prevalence due to successful treatment are unlikely.</p>	<p>Como se evaluó previamente utilizando NHANES, aproximadamente 3,9 millones de personas (IC, 3,1 a 4,8 millones de personas) entre 1988 y 1994 (2) y 4,1 millones (IC, 3,4 a 4,9 millones de personas) entre 1999 y 2002 habían estado alguna vez infectadas por el VHC (anti-VHC positivo) (3). Nuestros resultados también sugieren una posible disminución en la infección crónica VHC del 1,3% o 3,2 millones de personas (IC, 2,7 a 3,9 millones de personas), entre 1999 y 2002 (3) (Figura). Sin embargo, debido a un solapamiento en los IC del 95% en las estimaciones de las encuestas de las personas que algún vez han tenido una infección por el VHC o aquellos con una infección crónica, cualquier diferencia podría representar la variabilidad propia de una estimación calculada sobre una muestra de población civil estadounidense no insitucionalizada.</p> <p>Aunque el incremento del tratamiento exitoso de la infección por el VHC pueda causar también una disminución de la prevalencia estimada desde el último estudio, toda la información disponible actualmente indica que no más de la mitad de personas con infección crónica del VHC han sido sujetas a un análisis de anti-VHC; muchos de los que son positivos para anti-VHC no reciben atención médica o pruebas de confirmación mediante el ARN del VHC; y, si son positivas, son muy pocas hasta la fecha las que han recibido terapia antiviral y obtenido una respuesta viral sostenida indicativa de la curación (6,12-14). Así, las diferencias en la prevalencia debidas a tratamientos exitosos son improbables.</p>