
INFINITIVE CLAUSES IN MEDICAL ENGLISH LITERATURE: A RHETORIC - GRAMMATICAL APPROACH.

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Este artículo analiza el contexto retórico-gramatical de las cláusulas Infinitivas de la literatura médica escrita en inglés. Para tal fin se estudió un corpus de 32,000 palabras. Se registraron 157 cláusulas infinitivas y se analizaron sus antecedentes inmediatos las cuales se agruparon según su categoría gramatical. El análisis gramatical de dichos antecedentes indicó que 94 cláusulas infinitivas (60%) son complementos verbales; 34 (22%) son complementos adjetivales, y 29 (18%) complementos nominales.

Por otra parte, el análisis retórico-gramatical mostró que:

- 1) Los antecedentes verbales expresan nociones de propósito, causa-efecto, metodología y resultado de investigación;*
- 2) Los antecedentes adjetivales indican posibilidad, necesidad y/o probabilidad;*
- 3) Los antecedentes nominales son entes abstractos de connotación modal.*

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Refiriéndose a un estudio anterior (Salager: 1983), se puede observar que la mayoría de dichos antecedentes (86%) pertenecen a la capa léxica llamada "inglés médico fundamental". Esto explica la alta frecuencia de las cláusulas infinitivas en este tipo de prosa, e indica que ellas deberían enseñarse con prioridad en cualquier curso de lectura para propósitos específicos.

One hundred and fifty seven infinitive clauses were recorded and their immediate antecedents were grouped according to their grammatical category. The grammatical analysis of these antecedents indicated that 94 infinitive clauses (60%) are verbal complements; 34 (22%) are adjectival complements and 29 (18%) are nominal complements. The rhetorical analysis showed that:

- 1) the verbal antecedents express notions of purpose, cause-effect, methodology, result,*
- 2) the adjectival antecedents indicate possibility, probability, or necessity,*
- 3) the nominal antecedents are abstract items bearing a modal connotation.*

By referring to a previous study (Salager: 1983), it can be seen that most of these lexical units (86%) belong to the "fundamental ME" stratum; this explains the high frequency of infinitive clauses in ME literature and indicates that they should be taught early in the course of any scientific reading program.

Cet article analyse le contexte rhétorico-grammatical des propositions infinitives dans la littérature médicale écrite en anglais. Un corpus de 32,000 mots a été étudié; 157 propositions infinitives ont été enregistrées et leurs antécédents immédiats ont été groupés selon leur catégorie grammaticale. L'analyse grammaticale de ces antécédents indique que 94 propositions infinitives (60%) sont des compléments verbaux; 34 (22%), des compléments adjectivaux et 29 (18%), des compléments nominaux.

D'autre part, l'analyse rhétorique montre que:

- 1) les antécédents verbaux expriment des notions de but, cause-effet, méthodologie et résultats de recherche;*
- 2) Les antécédents adjectivaux indiquent des notions de possibilité, probabilité et/ou nécessité;*
- 3) Les antécédents nominaux sont des éléments abstraits à connotation modale.*

Si l'on se réfère à une étude antérieure (Salager: 1983), on s'aperçoit que la majorité de ces unités linguistiques (86%) appartiennent à la couche lexicale dénommée "Anglais médical fondamental". Ceci explique la haute fréquence des propositions infinitives dans ce genre de prose et indique qu'elles devraient être enseignées en priorité dans un cours de lecture scientifique.

In diesem Artikel wird der rhetorisch-grammatische Kontext der Infinitivkonstruktionen in schriftlichen medizinischen Texten untersucht. Als Grundlage für diese Studie diente ein Korpus von 32000 Wörtern. Es wurden 157 Infinitivkonstruktionen festgestellt, die als Erweiterungen vorausgehender Bezugswörter verschiedener grammatischer Wortklassen beschrieben werden können. 94 Infinitivkonstruktionen (=60%) sind Erweiterungen eines Verbs, 34 eines Adjektivs (=22%) und 29 eines Substantivs (=18%).

Weitere Ergebnisse der Analyse waren:

1) Die verbalen Kerne drücken Absicht, Grund/Wirkung, Methodologie und Forschungsergebnisse aus. 2) Die Adjektivkerne drücken Möglichkeit, Notwendigkeit und/oder Wahrscheinlichkeit aus. 3) Die Nominalkerne sind abstrakt mit modalen Konnotationen.

Bringt man diese Ergebnisse mit einer früheren Untersuchung (Salager: 1983) in Beziehung, so lässt sich feststellen, dass die meisten der Infinitivkonstruktionen in der untersuchten Textsorte und macht deutlich, warum sie in jedem Fachsprachlichen Lesekurs bevorzugt behandelt werden sollten.

INTRODUCTION: VOCABULARY AND SYNTAX IN LSP TEACHING.

In developing countries, the teaching of foreign languages is mainly restricted to the needs of professional communication, i.e., to the respective sub-languages of scientific literature. LSP programs have thus to be designed to meet the students' specific needs. In this context, as Hoffmann (1981: 108) mentions, various statistical analyses based upon terminological, syntactic and sociological investigations are required. But as Qvistgaard (1981: 143-151), Huckin and Olsen (1984: 120) so rightly point out, each country has its own problem and a program set up in a given country may not necessarily be adequate for another because the functions and the socio-professional situations are different, the difficulties vary according to the students' mother tongue and, very often, the language skills acquired at secondary school are far from sufficient. In Venezuela, some universities offer post-graduate courses in medicine where the students must be able to read specialized English language material as part of their university course work, i.e., to retrieve information from a passage of expository (academic) English as efficiently as possible. In fact, without a knowledge of the foreign language their development in their chosen sphere of work would be restricted or at least adversely affected. This entails the ability to recognize and handle the various lexical, grammatical, morphological and syntactic signals and structures of English and to appreciate how these cues cohere and interact to give meaning. Indeed, these nonhierarchical but related levels all function in the production of scientific statements. "Linguistic analysis may operate at any of the levels but the production of statements in discourse require all to function together." (Godman and Payne 1981: 23).

Several statistical frequency studies have already been carried out on the lexical and morphological aspects of medical English (ME) prose (Salager 1983, 1984 a, b, c,¹). Indeed, priority has been given to these aspects

¹By "ME" is meant the kind of literature likely to be consulted by foreign medical graduates, here specifically by Venezuelan post graduate medical students.

because it is now well recognized (Akirov 1983, Ulijn 1976, 1979, 1981, 1984) that reading texts in a foreign language (or in the mother tongue) does not require a thorough syntactic analysis of individual sentences and that most errors can be traced back to misinterpretation of lexical items. This means that conceptual (lexical) factors rather than syntactic are responsible for errors in comprehension.

But, as Ulijn observes (1981 : 264) : "Although we believe on the basis of psycholinguistic experimentation in a lexical and textual primacy in reading, we would not recommend a neglect of specific semantic-syntactic network ". A presentation of LSP should therefore not be limited to a few characteristics nor be identified with terminology alone, because the isolation of words would result in " an obvious neglect of syntactic feature which are central to LSP teaching " (Hoffmann 1981: 110). Besides, investigations into the sublanguages of science and technology (Mackay 1975, Mackay and Mountford 1978) , have shown that the distinctive features of LSP are not equally evident at all linguistic levels. Hoffman (1981: 114) is of the opinion that "it is the word and the phrase levels that yield the best results, i.e., list of typical lexical and syntactical items which may serve as a highly effective teaching/learning minimum".

1. PURPOSE AND APPROACH

This paper is part of a wider research intended to define the distinctive features of ME literature on the syntactic level. It is confined to the study of infinitive clauses in ME writing, more specifically to the rhetorico-grammatical analysis of the linguistic context in which they occur. Thus, we will first identify the grammatical category of the language units (or immediate antecedents) which are most frequently associated with infinitive clauses, and then analyze their rhetorical functions. Indeed, it has already been stated that infinitives are frequently used in the language of science and technology (Ewer and Latorre 1977, Rash-1978) but the rationale of such a construction has not been clearly stated, nor has

the analysis been carried out from a rhetorical viewpoint. Moreover, our approach is of a quantitative nature because the peculiarity of any LSP is, above all, determined by the frequency of its elements. As Hoffmann states (1981: 114): "It is the significantly frequent occurrence of certain speech elements, forms or structures that characterizes scientific writing. As a consequence, statistical methods play an important role in selecting an inventory for teaching purposes".

Another motivation for such an approach is that, as has been pointed out elsewhere (Hoffmann 1976, Ulijn 1979, Godman and Payne 1981), LSP consists of a particular selection of linguistic means taken from the total stock of the language, selection made for a special communicative purpose conditioned by professional needs. In other words, the peculiarity of LSP consists in the choice and arrangement of the linguistic means for a given purpose, and not in the linguistic means as such.

Indeed, Widdowson has suggested that the best way of characterizing different language registers is to discover what rhetorical acts are commonly performed in them, how they combine to form composite communication units and what linguistic devices are used as indicators. Besides, this examination of the usage of infinitive clauses in a representative sample of ME prose facilitates the analysis of this register by reducing the potential possibilities contained in it to a limited number of actualizations, and indicates which grammatical and rhetorical aspects of this particular structure should be emphasized in the actual teaching situation.

2. CORPUS AND METHODOLOGY

Hoffmann (1976: 390) states that, for the analysis of the most important syntactic phenomena, extracts of texts comprising 30,000 sign are sufficient, and that satisfactory and reliable results can be obtained from the analysis of such a corpus. Keeping this in mind, we selected a corpus of 15 sample texts of approximately 2,000 words each drawn from 12 different medical fields:

Psychiatry, Anaesthesiology, Cardiology, Internal Medicine, Neurology, Pediatrics, Obstetrics/Gynecology, Nephrology, Ophthalmology, Endocrinology, Hematology, Traumatology/Orthopedics. To ensure the representativeness of our sample, we sent a questionnaire to the heads of departments (what Bley - Vroman and Selinker (1984) name subject-specialist informants) where post-graduate medical courses were given, asking what journals and/or books they considered fundamental for graduate students or researchers in the field of medicine. This allowed us to select highly valued samples which the specialists in a given medical discipline perceives as central to their field.

In each text, the infinitive clauses were recorded one by one as well as the grammatical context (noun, verb and adjective phrases which immediately preceded them) in which they occurred. This grammatical context was then rhetorically analyzed in order to appreciate how certain grammatical features correlate with certain rhetorical features, and to attempt to determine which controls which. To that end, reference was made to a previous study carried out on the lexical characteristics of ME writing (Salager 1983).

3. RESULTS AND DISCUSSION.

For the sake of clarity, we will analyze the results of the present study according to the grammatical category of the immediate antecedent (or matrix sentence) of the infinitive clause, and illustrate them with a few examples taken from our corpus. As table 1 shows, one hundred and fifty seven (157) infinitive clauses have been recorded in our ME corpus. These occur as verbal complementation in 94 instances (60%), as adjectival complementation in 34 cases (22%) and as nominal complementation in 29 cases (18%).

A) *Verbal Complementation*: Twenty seven different verbs account for the 94 examples recorded in this category; they can be grouped in the following semantic fields: description of process: study, report, observe, show, be,

methodology of investigation : analyze, employ, use,
 design, cause-effect relationship : cause, allow, permit,
 enable, result (positive or negative) : help, find, prove,
 fail, remain, tend,

	VERBS	NOUNS	ADJECTIVES	TOTAL
total No.	94	29	34	157
%	60%	18	22%	100

TABLE 1
 Comparative results

hypothesis of a statement (uncertainty): appear, seem,
 assume, expect, presume, think,
 necessity : need, require, be (modal meaning).

Fourteen verbs were used three times or more, making up a total of 81 examples (86% of the total recorded): appear (12), fail (10), use (8), find (7), allow (6), show (6), need (5), require (b), expect seem (3), tend (3), help (3), report (3).
 Here are some examples:

NP¹ + VP +to V +Compl.

- These results *appear* to offer the potential for significant improvement.
- Richards et al. *failed* to find such an association.
- The purpose of this study is to present the experience of the authors.

As can be observed, the semantic fields to which these verbs belong correspond to the fundamental rhetorical

protocols of scientific technical prose. In the research carried out by Salager (1983), these items have been classified as "fundamental ME", i.e., that part of the ME lexicon which is homogeneously distributed across medical literature whatever the medical speciality (this has also been called sub-technical vocabulary: Cowan 1974, or academic vocabulary: Martin 1976). It is no surprise, therefore, to encounter a high incidence of infinitive complements in such linguistic contexts.

A.1 "That transformations"

Some of the above mentioned verbs can also govern a "that complement", but in scientific prose the infinitive complement is preferred over the "that-clause", the former being shorter but less explicit than the latter. Since experience has shown that in some cases the infinitive clauses which can be expanded (or transformed) into "that-clauses" set a comprehension problem for Spanish-speaking scientists, it is worthwhile discussing this point in more detail. Thirty five examples of such possible transformations have been recorded in our corpus; 12 occurred when the main verb was used in the active mood, and 23 when it was used in the passive mood.

A.1.1 THE "THAT-TRANSFORMATION"

Is possible with the following intransitive verbs in the active, mood : to appear (10), to seem (2).

We then have the following structure:

NP¹ + VP^{1act} + to V + Compl.

subject
matrix
sentence

Clinical evaluation appeau to be largely secondary to hyperthyroidism.

The esterase technique *seems* to be a failure.

If the "that transformation" is applied, then we have the following syntactic relationship:

$$\begin{array}{l} \text{It} + \text{VP}^1 \text{ act.} + \text{THAT} + \text{NP} + \text{VP}^2 \text{act.} + \text{Compl.} \\ \text{subject} \qquad \qquad \qquad \text{conjugated} \\ \text{"that clause"} \end{array}$$

it appears *that* clinical evaluation is largely secondary to hyperthyroidism.

It seems *that* they augment pain perception.

As can be seen in the above examples, the "that - complementation" is more complete than the infinitive clause, since it contains a subject and a conjugated verb. As Rash (1978 : 290) mentions, in this context, an infinitival complement may be thought of as a "that-complementation" which has lost its subject. Indeed, the subject of the matrix sentence becomes the subject of the "that-clause", with a verb specified for tense; generally an anticipatory "it" is introduced; the whole subject of the matrix sentence is thus transported after the preposition "that".

A. 1.2. With the transitive verbs *find* (1) and *report* (1), we have the following structure:

$$\begin{array}{l} \text{NP}^1 + \text{VP}^1 \text{ act.} + \text{NP}^2 + \text{to V} + \text{Compl.} \\ \text{direct object} \\ \text{matrix sentence} \end{array}$$

they *found* the effects to be similar.

They reported *that* the mortality rate varied.

In these examples, the direct object of the matrix sentence becomes the subject of the "that-clause" in which the verb is specified for tense.

A.1.3 Moreover, some verbs from the above list can also be transformed into a "that-clause", but only if they are in the *passive* mood. Twenty three such cases have been recorded with the following verbs : to show (6)

to find (6), to expect (3), to appear (2), to report (2), to assume (1), to observe (1), to presume (1), to think (1). The following structure is observed:

NP¹ + VP¹ pass. + to V + Compl.
subject
matrix
sentence

Vascular lesions have been *thought* to be important in the development of hypertension.

The patients have been *shown* to have a very high mortality rate.

The drugs were *found* to be lethal.

Epidural administration was *reported* to be less acceptable.

By applying the "that-transformation", the subject of the matrix sentence becomes the subject of the "that-clause", the anticipatory "it" becomes the subject of the matrix sentence and the infinitive is transformed into a conjugated verb:

It VP¹ pass. + that + NP¹ + VP² + Compl.
subject conjugated
"that clause"

It has been thought *that* vascular lesions were important in the development of hypertension.

It has been thought *that* the patients have a high mortality rate.

It has been found *that* the drugs were lethal.

It has been reported *that* epidural administration was less acceptable.

Experience has shown that comprehension problems are frequently encountered in the last two cases because such infinitive complements do not exist in the students native language (Spanish), neither do they exist in

Only two instances of such a construction have been recorded and it can be noticed that they are, in fact, a transformation of the anticipatory *it*.

- A. 4 It is worthwhile noting one of the distinctive features of these verbs which is that the semantic restriction of the subjects of the matrix sentence (NP¹) are mainly abstract nouns indicating a method, a means, an influence, or an aim, whereas in belletristic literature the subjects are generally proper, concrete nouns or personal pronouns referring to persons and not to objects. For example, in our corpus, the subject of *was* only 3 times used in reference to a person and 7 times to an abstract noun (*program, result, data*). Here is a list of the subjects of the most frequent matrix sentence verbs used in our ME sample:

VERBS	SUBJECT
fail	program, clinicians, physicians, morphine, X (a person), result, data, technique, method.
need	question, effort, symptom.
be	possibility, observation, purpose, aim.
help	fact.
allow	diagnosis, data, figure.
seem	method, technique.
show	result, data, drug, patient.
appear	evaluation, result.

It is interesting to note that the majority of these nouns have also been classified as fundamental ME lexical units (Salager 1983). This explains once more the high frequency of infinitive clauses in scientific writing.

B) *Adjectives*

Thirty four instances of adjectival antecedents of infinitive clauses have been recorded. Their distinctive features are:

French nor in Russian.

A useful pedagogical strategy would thus be to explain and illustrate (with examples taken from the literature which the students consult) the possible expansion of the infinitive complement into the "That-Clause".

A.2 *Be* : Special mention must be made of the verb "to be" as a verbal antecedent of an infinitive clause. It can be used in two different ways, each having a number of formal differential signs.

A.2.1 *Be* : basic meaning. When *Be* is used its basic sense (mere statement), the active mood of the infinitive is used. Five cases have been recorded in our corpus.

NP¹ + *Be* + to V act. + Compl.
conjugated

The first aim *is* to support the hypothesis that...

The purpose of this study *is* to illustrate the strengths and weaknesses of the program.

A.2.2 *Be* : modal meaning. In such cases (2 have been recorded), the infinitive of the passive voice is used, e.g.,

NP¹ + *Be* + to V pass. + Compl.
conjugated

Accelerating flow *is to be recommended*.

If a similar study *is to be conducted* in the future....

A. 3 *Infinitives in subject position.*

To V + NP¹ + VP + Compl.

To list each of these lesions would have made the statistics misleading.

To assess the reasons is still impossible.

1. they usually express antonymic or synonymic relationships referring to a task, a problem set up by scientific inquiry (e.g., hard, easy, difficult etc.).
2. they perform such rhetorical functions as possibility, difficulty, and/or necessity.

The most frequently used ones are : un/able (8), im/possible (6), difficult (6), un/necessary (3), un/likely (2), which generally occur along with an impersonal expression.

It + *be* + Adj. + to V + NP¹ + Compl².
conjugated

It is then *possible* to make a correct diagnosis..

It is relatively *simple* to provide low calcium dialyzate.

It is unnecessary to identify lesions of this kind.

Sometimes, the infinitive may be part of an accusative and infinitive construction preceded by *for*; in this case, the accusative may be interpreted as the subject of the infinitive, e.g.,

It is not *uncommon for* a patient to develop this symptom.

Nasal polyps need not *be present* for a patient to develop an idiosyncratic reaction to aspirin.

By referring to the statistical study carried on the lexical level of ME literature (Salager 1983), we once more notice that the majority of these adjectives belong to the fundamental ME stratum.

C) *Nominal Antecedents*

Eight different nouns account for the 29 examples

²These sentences are equivalent to the infinitives in subject position (see point A.3), e.g., "To make correct diagnosis is then possible"

(18%) of nominal antecedents of infinitive clauses. They present a number of rhetorical and grammatical features: They are abstract, bear a modal connotation and most of them are derivatives of the verbal roots mentioned in section A); besides, they all belong to the sub-technical ME vocabulary and indicate the process and/or methodology of investigation, e.b., in/ability (11), failure (7), attempt (5), tendency (2), way (1), techniques (1), fact (1) and Method (1).

... the tendency to focus on the cost of care in the last months of life.

... our attempt to determine whether VIP could be responsible for the watery diarrhea of pancreatic cholera.

CONCLUSION

As can be observed (cf. Table 2), infinitives are engendered by a certain number of lexical items whose rhetorical functions can be categorized as follows:

GRAMMATICAL	RHETORICAL	EXAMPLES
verbs	description of process methodology of investigation cause-effect relationship result hypothesis necessity	show, report use, analyze cause, enable fail, prove seem, expect need, require
adjectives	possibility, probability difficulty necessity	im/possible, un/likely hard, difficult un/necessary, un/essential
nouns (abstract entities, investigation modal connotation)	process/methodology of	failure, attempt technique

TABLE 2

Recapitulatory Table

-
- a) the verbs mainly express a notion of purpose, cause-effect relationship, or methodology of investigation;
 - b) the adjectives chiefly indicate notions of possibility and/or necessity ;
 - c) the nouns are principally abstract entities which bear a modal connotation.

As stated before, the majority of these lexical units belong to the sub-technical vocabulary of ME prose; this in turn, explains the high incidence of infinitive clauses in this scientific register.

Infinitives (elliptical constructions which are generally convenient substitutes for longer phrases and thus improve the conciseness of technical prose, i.e., the linguistic economy of scientific language) should therefore be considered as one of the central syntactic structures of ME literature and be given priority in the curriculum of any reading course. Indeed, the introduction of frequent linguistic patterns during an early period of language teaching significantly enhances motivation. The students will recognize the immediate practical use of this high frequency model and will be more successful within a shorter time.

Finally, the advantage of such rhetorico-grammatical studies is that they allow the instructor to approach the teaching of grammar from a notional, functional and semantic standpoint and not only from a formal point of view.

Of course, our study is far from complete. It represents only a small part of the syntactic minimum for a selective short reference-reading grammar of the ME register, which would be a kind of basic teaching reference for all learners at the initial and intermediate stages. This would be an invaluable tool for foreign medical graduates to expand their professional horizon by enabling them to understand the sentence structures typical of their sub-language. If employed systematically by the ever increasing number of people who use LSP, this opus should result in a more effective mastery of the medium.

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