Why read when you can watch ? Video articles and knowledge representation within the medical domain

Sara Carvalho* ***, Christophe Roche** *, Rute Costa*

* NOVA CLUNL, Centro de Linguística da Universidade NOVA de Lisboa, Avenida de Berna 26-C, 1069-061 Lisboa – Portugal
** Condillac Research Group – LISTIC, Université Savoie Mont-Blanc, Campus Scientifique, 73376 Le Bourget du Lac cedex – France
*** Centro de Línguas, Literaturas e Culturas – Departamento de Línguas e Culturas, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro – Portugal
sara.carvalho@ua.pt, christophe.roche@univ-savoie.fr, rute.costa@fcsh.unl.pt

Abstract. Non-verbal forms of knowledge representation have become increasingly important in Terminology, both from a theoretical and methodological perspective. Examples of non-verbal knowledge representations have been abundantly present in medicine, the subject field under analysis, for centuries. However, due to the current – and impressive – technological progress in healthcare, resources that combine text, high-resolution video, as well as 2D and 3D animation, are now an integral part of modern medicine and play a pivotal role, especially in medical procedures. In this respect, this paper will focus on one of the most recent and promising of such multimedia resources, namely the video article, a peer-reviewed and indexed article which comprises both verbal and non-verbal elements (e.g. narration by experts and videos of surgeries including external and internal footage) and, therefore, verbal and non-verbal forms of knowledge representation. Such features make video articles an interesting resource to consider in the light of Terminology's double dimension approach. This will be illustrated in the paper through the analysis of a video article focusing on a surgical procedure, i.e. a laparoscopy for gynecological purposes.

1. Introduction

Specialized communication necessarily involves knowledge transfer, which requires knowledge representation that, in turn, can be either verbal, non-verbal, or mixed in nature (cf. Galinski & Picht, 1997, p. 42)[1]. As regards medicine, the subject field under study in this paper, diversity is the key feature underlying knowledge representation. Medicine is, in fact, a rather unique domain in this respect. To quote William Osler, a Canadian physician, "the practice of medicine is an art, based on science" (1904). It is, therefore, a practice-oriented field, and one where plain text still plays a key role, but also where the non-verbal has always been present, as a way to complement human observation and support the prevention, diagnosis, and treatment of diseases.

On the other hand, the development of increasingly visual and multimedia-based products that integrate both verbal and non-verbal elements has emerged as a byproduct of the exponential technological progress that has characterized healthcare in recent decades. One of the most recent – and promising – examples of such multimedia-based resources is the medical video article, a peer-reviewed and indexed scientific article fully presented in video format. By comprising both verbal and non-verbal elements (e.g. narration by experts and videos of surgeries including external and internal footage) and, therefore, verbal and non-verbal forms of knowledge representation, it is argued that video articles may constitute a pertinent resource in terminology work.

Therefore, and within the scope of a PhD project[2] which aims at the creation of a multilingual terminological resource based around the concept of <Endometriosis>[3], a chronic, inflammatory gynecological disease that is yet relatively unknown, even among the expert community (cf. Dunselman *et al.*, 2014), this paper is organized as follows: firstly, the theoretical background of this work is outlined, namely a double-dimensional approach to Terminology, which focuses on the synergies between what is conceptual and what is lin-

1 A more thorough analysis on the role of the non-verbal in terminology and knowledge representation may be found, for instance, in Galinski & Picht (1997), Picht (1999, 2011), Madsen (2016), or Prieto-Velasco (2016).

2 The PhD thesis in question, entitled "A terminological approach to knowledge organization within the scope of endometriosis: the EndoTerm project", was successfully concluded in September 2018 (cf. Carvalho, 2018).

3 Throughout this paper, concepts will be capitalized and written between single chevrons, whereas terms will be presented in lower case and between double quotation marks (cf. Roche, 2012).

guistic while also addressing the impact of such a perspective within terminology work. Terminology-related ISO standards will also be addressed in this section, in particular on how they categorize verbal, non-verbal, and multimedia information. Secondly, the topic of knowledge representation in medicine will be explored, as well as the unique features of the medical video article as a knowledge representation resource and its added value in terminological projects dedicated to healthcare. Thirdly, and based on the example of a medical video article regarding a surgical procedure, i.e. a gynecologic laparoscopy, and on the information gathered from that analysis, a concept modelling proposal for <Laparoendoscopic single-site surgery> will be put forward, followed by the concluding remarks.

2. Terminology and knowledge representation

2.1. A double-dimensional approach to Terminology

This approach, which encompasses both a linguistic and a conceptual dimension that are interrelated, has been described by Roche (2012, 2015), Costa (2013), and Santos & Costa (2015). According to Roche (2015, p. 136), Terminology is both a "science of objects and a science of terms". For Santos & Costa (2015), it is precisely this double dimension, together with the study of how both dimensions relate to each other, that grants Terminology the status of an autonomous scientific subject.

This double dimension approach implies, therefore, that the experts' conceptualization(s) of a given subject field, on the one hand, and the discourses produced by them, on the other, must be taken into account. The conceptual dimension is regarded, in this research project, as the foundational element, since, and corroborating what is stated in the ISO 704 (2009), "producing a terminology requires an understanding of the conceptualization that underpins human knowledge in a subject area" (p. 3). However, the linguistic dimension cannot be underestimated. Despite the pitfalls that often characterize natural language, such as ambiguity, polysemy, or ellipses, even in specialized communication, resorting to a specialized corpus allows a valuable insight into a given community of practice and into the way the experts view their domain.

Hence, the cornerstone of this approach lies in the complementarity of these two fundamentally different dimensions. Furthermore, understanding the relationship between the two dimensions plays a key role in terminology work, as it will contribute to define a methodology that does not compromise

the main goal of a terminological project as it is understood in this paper, which is to represent, organize and share the knowledge pertaining a certain domain, based on the way it is conceptualized by a community of experts.

As such, experts are considered indispensable to terminology work, working collaboratively with the terminologist in different steps of the project, in order to identify the fundamental concepts of that subject field, the way they relate to each other, as well as how they are represented, both verbally and non-verbally (cf. Costa *et al*., 2012). As a way to illustrate the preceding ideas and to substantiate the case study that follows, the core Terminology-related ISO standards (ISO 1087-1, 2000 and ISO 704, 2009) were analyzed to see how these different forms of concept representation are depicted.

2.2. Forms of concept representation in Terminology-related ISO standards

As argued earlier, the notion of concept is regarded as key in any terminological project under the double-dimensional approach, and the ISO 1087-1 standard defines it as a "unit of knowledge created by a unique combination of characteristics" (2000, p. 2). And how are concepts represented within Terminology as a subject field and its related work? According, again, to ISO 1087-1 (2000), either via a designation ("representation of a concept by a sign which denotes it") or a definition ("representation of a concept by a descriptive statement which serves to differentiate it from related concepts") (*ibid*., p. 6).

As regards designations, this ISO standard clearly identifies terms and appellations as "verbal designations" of concepts, further specifying that the former refers to a general concept, whereas the latter deals with an individual concept. Despite considering symbol a "type of designation", ISO 1087-1 does not proceed to define it. One's assumption that a symbol may be, as a counterpart to term and appellation, a non-verbal type of designation is corroborated, although not through a clear-cut definition, by the ISO 704 (2009), which states that a designation can represent a concept either via linguistic or non-linguistic means (p. 34), adding that a symbol's "visual representation of concepts functions independently of any given language" (p. 41).

When it comes to definitions, the ISO 1087-1 places its focus, again, solely on natural language definitions, namely the intensional (describing "the intension of a concept by stating the superordinate concept and the delimiting characteristics") and the extensional, whereby all the subordinate concepts

are enumerated under one criterion of subdivision (2000, p. 6). While the ISO 704 highlights intensional definitions as "the most explicit and precise method of concept definition" (2009, p. 44), it acknowledges other types of definitions (extensional, ostensive, lexical, precising, and stipulative). Among these additional types, the ostensive definitions can play an important role in our discussion concerning forms of concept representation, since they depict "non-lexical representations of the concept (such as a drawing, an illustration, a video, a sound clip, a computer animation, etc.)" or may even "point to an object" (p. 45). The standard adds further information in this regard, indicating that multimedia can also be used to display non-lexical concept representations and, hence, ostensive definitions (*ibid*.)[4]. Fig. 1 below summarizes the information presented so far concerning both designations and definitions, according to both ISO 1087-1 and ISO 704 standards.

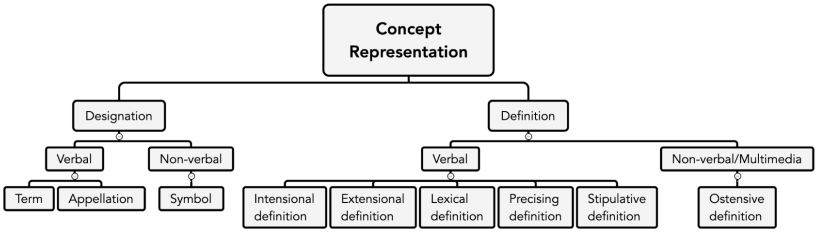

Figure 1 – Types of concept representation according to the ISO 1087-1 (2000) and ISO 704 (2009) standards.

Also in this regard, the ISO 704 (2009) standard outlines potential limitations of ostensive definitions, such as the fact that it may not always be clear what is being referred to or that it may be difficult to identify the superordinate concept, thereby recommending that these definitions "are best employed as complements to intensional definitions" (p. 45-46). We argue, however, that more technologically advanced and mixed forms of concept representation in certain subject fields – medicine being one of them – are here to stay and will become so prevalent that a discussion concerning the apparently clear-cut

4 In relation to the previous version of the ISO 704 standard, published in 2000, the 2009 version adds multimedia to the various forms of concept representation, in line with technological innovation, and also with Galinski & Picht's claim, back in 1997, of multimedia as a "dynamic and multidimensional" form of concept representation (p. 58).

notions of designation and definition will have to occur in upcoming revisions of Terminology-related standards. To further substantiate this claim, the following section will outline the role of non-verbal, but also mixed, forms of concept representation in medicine by describing a relatively new type of resource in this area: the video article.

3. The dynamics of knowledge representation in healthcare

3.1. Introduction

As referred to in the introductory section, knowledge can be represented in various ways in medicine. Fig. 2 illustrates several examples specifically related to the field of endometriosis: [1] a scientific article presenting a consensus statement about the disease; [2] the institutional website from a healthcare provider containing information about this pathology and targeted at a broader audience; [3] a monolingual glossary of endometriosis, available in the global online platform endometriosis.org[5]; [4] a diagram containing the representation of endometriosis according to SNOMED CT[6]; [5] an image depicting the different locations of endometriosis lesions; and [6] a screenshot of a video with 3D animations describing a hysterectomy, a common surgical procedure for patients with endometriosis.

5 http://endometriosis.org/glossary/

6 A comprehensive and multilingual clinical healthcare terminology that supports the representation of clinical content in Electronic Health Records (EHRs) in a consistent, comparable, reliable and computer-readable way (IHTSDO, 2018).

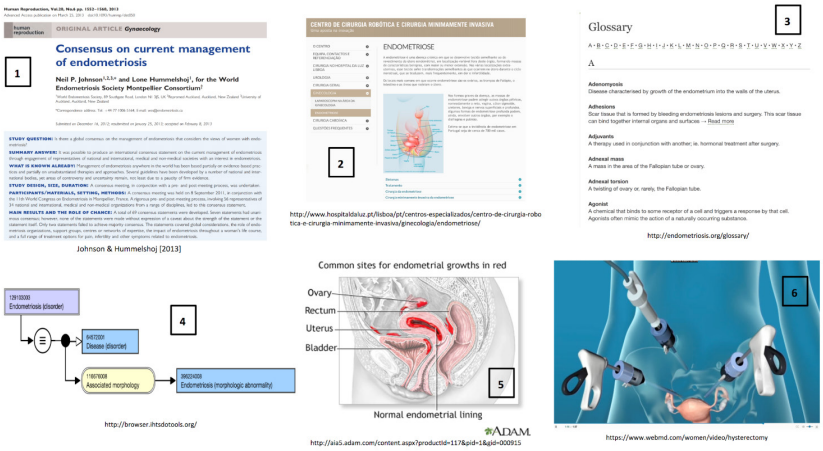

Figure 2 – Examples of knowledge representation within the scope of endometriosis.

It is clear, therefore, that on the one hand, verbal elements do play a critical role in the representation and dissemination of medical knowledge. Although specialized texts do not contain concepts *per se*, they provide, via the verbal designations of such concepts – the terms – and the systematic study of certain regularities[7], a key access point to the knowledge of a given domain. On the other hand, the relevance of a more visual approach to knowledge representation has been unequivocal in medicine: for centuries, medical illustrations have contributed significantly to the representation and dissemination of medical knowledge, and their quality, as well as degree of precision, have gone hand in hand with scientific and technological progress. An example of Henry Gray's *Anatomy of the Human Body* (1918)[8], namely an illustration of the female reproductive system, is provided in Fig. 3.

7 What Meyer (2001) describes as Knowledge-Rich Contexts and their respective Knowledge Patterns.

8 Available at: https://www.bartleby.com/107/

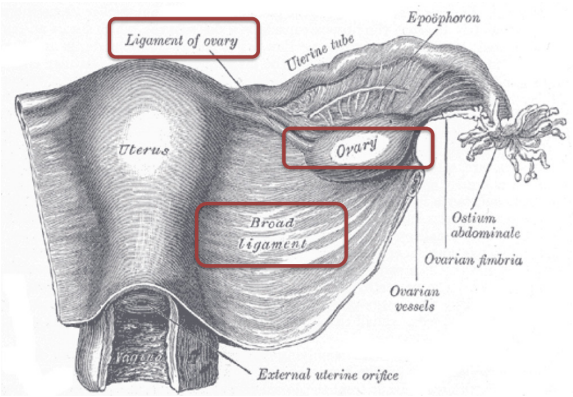

Figure 3 – Henry Gray's illustration of the female reproductive system (1918).

The illustration in question provides a rather common example in this subject field, by combining verbal and non-verbal elements in order to convey knowledge. Yet the existing terms (e.g. "ovary", "ligament of ovary", "broad ligament", etc.), albeit providing useful information, are not part of an actual text. The same happens with #5 in Fig. 2. So rather than being regarded as signs from a Saussurean perspective – in the sense that, when found in discourse, terms can give rise to the construction of meaning (a *signifié* in the Saussurean sense), i.e. they acquire value in discourse –, the terms that can be identified in Fig. 3 could be perceived as signs according to the philosopher William of Ockham, for whom a sign is "tout ce qui, étant appréhendé, fait connaître quelque chose d'autre" (1988, p. 7). In other words, they have the capacity to exist outside of discourse, pointing towards the concept and thus granting access into the specialized domain as well.

Bearing in mind the content of section 2.2 and the diagram in Fig. 1, it should also be noted that medicine is one of the subject fields where, in addition to verbal concept definitions (both intensive and extensive), non-verbal definitions can be rather prevalent as well. The image below (Fig. 4), which is part of a classification system created by the American Society for Reproductive Medicine (ASRM), represents not only the female reproductive system, but also the extent and location of endometriosis lesions and adhesions. Far from seeing a mere illustration, a subject field expert would immediately recognize it as a representation of Stage-IV (severe) endometriosis. The resource

in question could, therefore, be perceived as an example of a non-verbal, thus ostensive definition of the <Stage-IV endometriosis> concept.

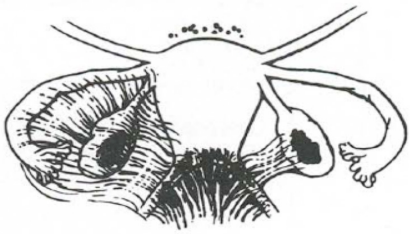

Figure 4 – Stage-IV endometriosis (ASRM, 1997).

In addition to the aforementioned illustrations and diagrams, and as stated earlier, the exponential technological progress that has characterized healthcare in recent decades has led to the development of more and more multimedia content. By combining different media types (e.g. sound, animation, text, graphics and video) and, thus, verbal and non-verbal elements, with the purpose of presenting information via a computer (cf. Bornman & Solms, 1993), multimedia is, in itself, a mixed form of knowledge representation. As will be shown in the following section, the video article is a relatively new type of such multimedia-based resources, used mainly in the context of scholarly communication.

3.2. The video article: a double-dimensional resource in medical knowledge representation

Falcone & Setúbal (2013) define the video article as a peer-reviewed scientific article containing "all the elements outlined in a structured abstract and full written manuscript but presented in video form" (p. 267). According to these authors, video articles constitute, therefore, a new paradigm in clinical research, since these videos, far from being perceived as mere "adjunct material", are now "the focal point of research", uniquely providing a "visual presentation of research" (*ibid.*).

Such video articles, which are also indexed, mainly in PubMed[9], have become increasingly popular within the biomedical field, especially among the surgeon community, which is understandable, given that most video arti-

9 Cf. https://pubmed.ncbi.nlm.nih.gov/

cles focus on surgical procedures or techniques. They can be found either in the so-called video journals[10], i.e. scientific journals which consist solely of this type of resource, or in 'traditional' journals, some of which have recently created media sections and appointed media editors, responsible for coordinating the reviews of the videos submitted for publication[11]. In the first category – that of video journals –, JOVE claims to be the first of its kind. Founded in 2006 by Moshe Pritsker, it currently publishes more than 100 new videos every month and, in 2018, it had an impact factor of 1.108.

But why the sudden and increasing interest in this type of article? According to several studies (e.g. Aarts *et al.* 2015; Baker, 2016), the underlying issues may be related to the poor reproducibility of research results: on the one hand, due to difficulties in replicating lab experiments or procedures by relying only on text-based documentation (there may be inconsistencies, biased results, etc.) and, on the other hand, most research units struggle to send researchers across the globe to receive specialized training. Video articles attempt, therefore, to solve both problems: the person watching the video is listening to and observing the actual expert in the comfort of their own research lab or operating room.

Bearing in mind the background provided in section 2, we argue that this new type of knowledge representation resource in the medical domain is double-dimensional as well since it combines, within a given field of specialized knowledge, verbal and non-verbal elements that interconnect, thereby enabling knowledge representation and, subsequently, knowledge transfer via a more comprehensive – in the sensorial perspective – dissemination strategy. In addition to the aforementioned context of scholarly communication, specialized videos such as these can be particularly effective in the teaching/learning of surgical procedures and techniques.

In short, both the conceptual and the linguistic dimensions interconnect in the video article, thus making it a pertinent resource to take into account in terminology work, especially within a double-dimensional approach. As a

10 E.g. the *Journal of Visualized Experiments* (JOVE) (https://www.jove.com/), the *Video Journal of Clinical Research* (http://www.videojournalofclinicalresearch.com/), and, more recently, the *Latest Thinking* (LT) platform (https://lt.org/).

11 Some examples of recent "Media Sections" related to gynecology and obstetrics can be found in *Fertility & Sterility* (https://www.elsevier.com/journals/fertility-and-sterility/0015-0282/guide-for-authors) and in the *Journal of Minimally Invasive Gynecology* (JMIG) (https://www.elsevier.com/journals/journal-of-minimally-invasive-gynecology/1553-4650/guide-for-authors).

new type of scholarly communication that seems to be here to stay, at least in the medical community, its inclusion in a specialized corpus in a medical terminology project may eventually become inevitable, which will, in turn, pose interesting theoretical and methodological challenges.

4. Case study : video article on single-port laparoscopy

4.1. Introduction

The case study presented here is based on a medical video article entitled "Single port laparoscopy"[12], which depicts a gynecological procedure – in this case, a hysterectomy, commonly seen as a last resort in cases of severe endometriosis – using a relatively recent type of surgery the authors call single-port laparoscopy.

After the initial acquaintance with the video, this resource was uploaded into CLAN (Child Language Analysis)[13], an open-source, cross-platform software originally developed to create and analyze transcripts in the Child Language Exchange System (CHILDES) database but that, since 2000, has broadened in scope, including corpora for aphasia, or traumatic brain injury. The purpose was to test this tool as a possible option for future work with this type of corpus, in particular CLAN's ability to link video, audio and transcript within the same work environment, making transcription activities easier by enabling the transcriber to clearly delimit the various utterances, to repeat those segments as often as necessary, or to increase/decrease the playback speed. The full transcript can also be exported into .txt if necessary, which facilitates the use of textual-corpus processing/analysis tools such as AntConc[14]. Fig. 5 displays a screenshot of one of those tests. In this specific case, the narration by the expert accompanies 3D animations, thereby illus-

12 Available at : https://www.fertstert.org/article/S0015-0282(12)00387-1/fulltext
13 http://dali.talkbank.org/clan/
14 A freeware corpus analysis toolkit used mostly for concordancing and text analysis (Anthony, 2018).

trating the interrelation between verbal and non-verbal elements referred to earlier.

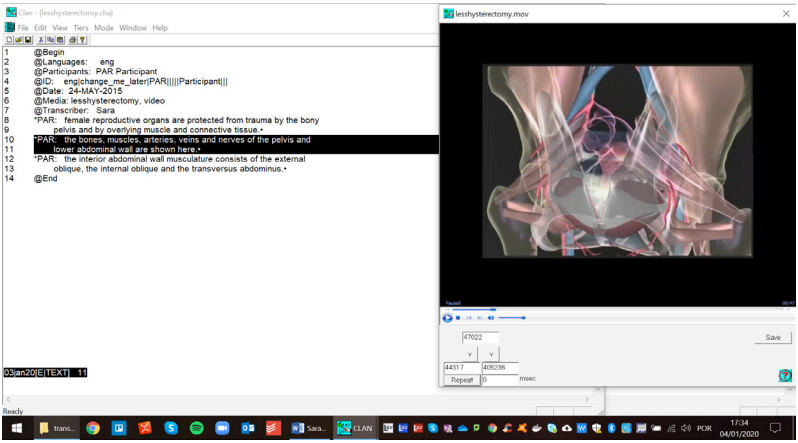

Fig. 5 – Screenshot of a partial transcription of the video using CLAN.

Throughout the video, the expert/narrator highlights the apparent lack of terminological consensus among the expert community in what concerns <Single-port laparoscopy>, listing the designations – and their respective acronyms/initialisms presented in Table 1.

Designations for single-port laparoscopy
SILS Single-incision laparoscopic surgery
SSL Single-site laparoscopy
SPA Single-port access surgery
OPUS One-port umbilical surgery
TUES Transluminal endoscopic surgery
NOTUS Natural orifice transumbilical surgery
SLAPP Single laparoscopic port procedure
LESS Laparo-endoscopic single-site surgery

Tab. 1 – *Designations for single-port laparoscopy identified in the video.*

The narrator then proceeds to state that for the purposes of that video, they would continue to refer to that procedure as "single-port laparoscopy". Interestingly, and while that consistency is maintained from an oral standpoint, the same does not happen with the written information that is shown in the video. A few minutes later, the terms "single port umbilical surgery" and "one-port umbilical surgery" appear in a segment of the video dealing with the advantages and disadvantages of this surgical technique. Through the further study of this issue, more than 20 acronyms used to designate this concept were identified in the literature and systematized in Carvalho *et al.* (2016). It was also found that a multidisciplinary medical consortium[15] gathered in 2008 to end that terminological dispersion in the area, having decided that the term "laparoendoscopic single-site surgery" (also known as LESS surgery) most accurately depicted the surgical procedure in question.

4.2. Concept modelling proposal

The following stage consisted of the creation of a concept modelling proposal for <Laparoendoscopic single-site surgery> based not only on the information provided by the video article and the preceding textual sources, but also on other videos about the same topic, as well as on the feedback from two senior expert gynecologists who are also surgeons. This proposal was developed using a software environment for concept system building called OTe Soft (OntoTerminology engine), designed by the Condillac Research Group[16], which has a clear concept orientation, although the user can also incorporate terms and, thus, integrate the linguistic dimension.

OTe Soft is structured around concepts, perceived as knowledge of a plurality of things that "help organize reality by grouping similar objects through what they have in common (Roche, 2015) (e.g. <Laparoscope>). One or more terms may be assigned to each concept, in various languages: e.g. "laparoscope" (EN); "laparoscópio" (PT); "laparoscope" (FR), etc. In addition, a concept may be qualified by attributes, which have a given value, and be

15 Called the Laparoendoscopic Single-Site Surgery Consortium for Assessment and Research (LESSCAR), that published a consensus statement with the main conclusions of that meeting (Gill *et al*., 2010).

16 http://new.condillac.org/

assigned one or more instances, also called "things", i.e. representations of elements in reality (cf. Fig. 8).

Concepts are linked to each other through concept relations : subsumption (is_a) (generic) and composition (part_of) (partitive) are presented by default. However, the tool allows the user to create new concept relations, as long as the logical principles are maintained (e.g. two concepts cannot be linked by the *instance of* relation)[17]. These relations are represented by different colors, in order to facilitate the graph's visual readability. The final "product" is called model, or semantic network, which can be exported in various formats (json, RDFS or OWL).

The following figures (6, 7 and 8) present examples of micro-concept maps built around the concept of <LESS surgery>. The first micro-map (Fig. 6) aims to position <LESS surgery> within the broader concept of <Surgery>.

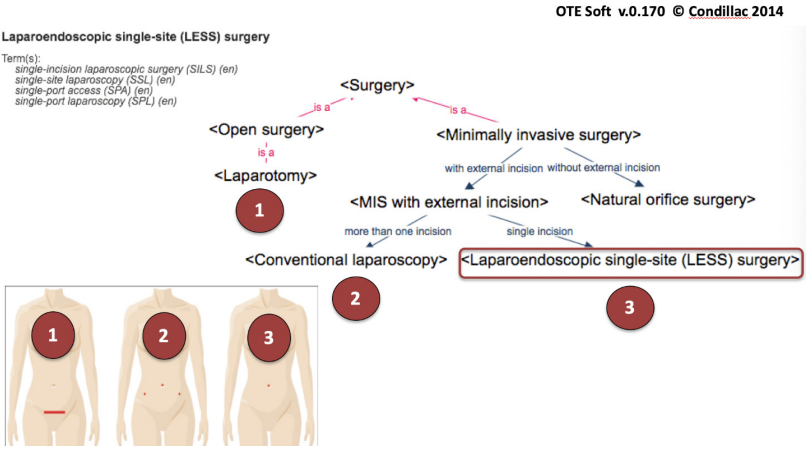

FIG. 6 – *The concept of <Laparoendoscopic single-site surgery>.*

There is a first subdivision presenting <Open surgery> and <Minimally invasive surgery> as subordinate concepts of <Surgery>. In the latter subtype, the subsequent hierarchy-based modeling was constructed through specific differentiation, bearing in mind the Aristotelian definition of *genus* +

17 One of the challenges of creating a concept-modeling proposal lies, in fact, in defining other types of concept relations that do not fall under the generic or partitive categories. The ISO standards (1087-1 :2000 and 704 : 2009) lack diversity and systematization, since they classify all the remaining relations as "non-hierarchical" (cf. Nuopponen 2011, 2014).

differentia[18]: i) with/without external incision ; ii) with one incision/with more than one incision. Besides other advantages, such as the operationalization potential provided by the exporting into computer-processable formats, this concept modeling strategy constitutes a valuable starting point for the terminologist in the construction of natural language definitions.

On the upper left side, the linguistic dimension is also visible, and it includes all the terms associated to the <LESS surgery> concept. In this case, it was decided to list some of the synonyms of the concept identified in the literature. Although the image does not show that, the user has the possibility of navigating through the concept network via concepts, terms, or relations. The three images in Fig. 6 were added afterwards, as the version of the OTe Soft tool we worked with did not allow the user to upload external resources (e.g. images, videos, diagrams, etc.)[19].

Fig. 7 explores the types of umbilical incisions that may occur in a LESS surgery, being that the single incision in the umbilicus (navel) is regarded by the expert community as the essential characteristic of the concept, i.e. the characteristic which makes the concept what it is and constitutes its essence (cf. ISO 1087-1 : 2000). In this figure, the metaphoric use attributed to the <Omega incision> should also be emphasized.

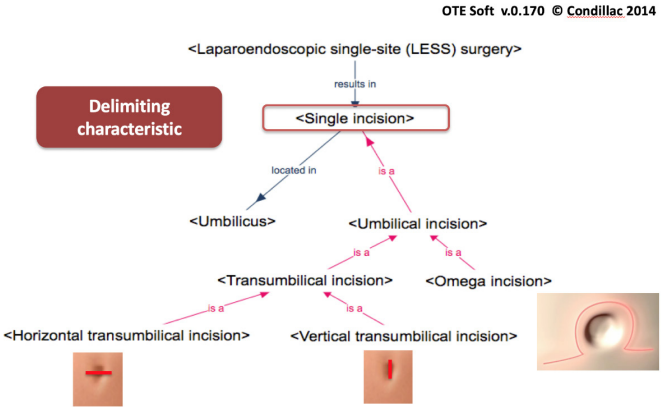

Fig. 7 – *Types of <Umbilical incision>.*

18 These, along with other Aristotelian categories, are explored in Porphyry's *Isagoge* (2003 edition).

19 This also applies to the images in the remaining figures.

Fig. 8 contains a more detailed insight on the types of laparoscopes that exist, one of which - <Flexible video laparoscope> - is currently being used to perform LESS surgeries. In this case, the *EndoEYE* is presented as an instance of this concept. There is also a basic distinction within the expert community between flexible and rigid laparoscopes, as depicted by the map.

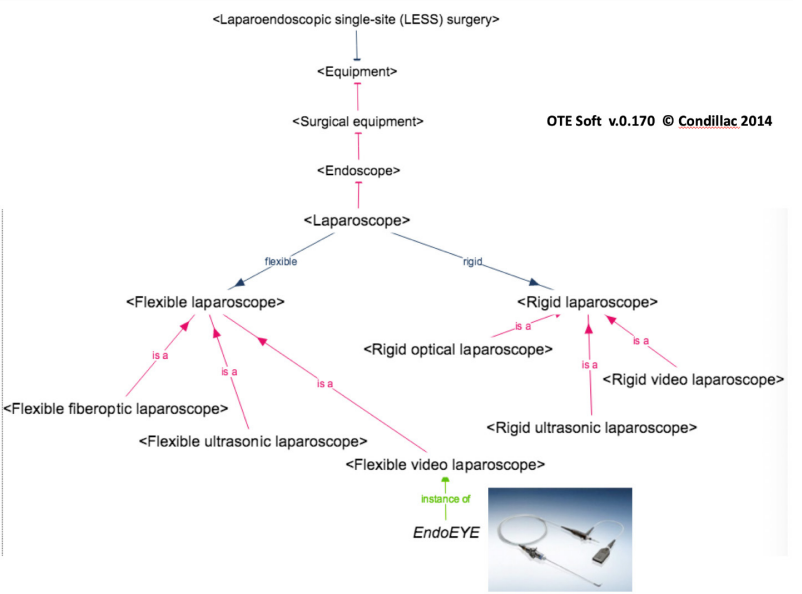

Fig. 8 – *Types of <Laparoscope>.*

5. Concluding remarks

To conclude, it is believed that the video article is a resource that terminologists working in the medical (or biomedical) domain should bear in mind, due to its double-dimensional nature and to its increasing importance in the subject field. The added value for Terminology is clear: firstly, it provides access to up-do-date knowledge, which is especially relevant in technologically advanced and cutting-edge areas such as surgery; secondly, there has been an exponential growth in video journal and e-learning surgery platforms

in life sciences, which will eventually lead to a considerable volume of data – and knowledge – that Terminology should not ignore.

The integration of such multimedia content into specialized corpora does, however, pose challenges to terminology work, for once concerning the methodology to be used, but also the tools for treating that corpus. In this particular case, the very access to the resources is also an issue, as it is, for the most part, extremely expensive/difficult due to data protection issues.

Nowadays, physicians who are training to become surgeons do so not only by reading books and scientific articles on their areas of specialty, but also by observing senior experts and participating in surgeries as assistants, or by watching video articles and live surgeries, many of which are broadcasted to the whole world. It is believed, in fact, that within the life sciences domain and perhaps in the next decade, some journals may cease to exist in its current, 'traditional' format, gradually being replaced by the video article format. This Brave New World of Medicine is challenging, but Terminology can – and will – still play a part. To quote Galinski & Picht (1997, p. 55), the increasing "power" of non-verbal – and mixed – forms of concept representation in the representation and dissemination of specialized knowledge may lead Terminology to rethink, in the very near future, their current role as 'mere' secondary, accessory material.

Acknowledgements

This research has been financed by Portuguese National Funding through the FCT – Fundação para a Ciência e Tecnologia as part of the project Centro de Linguística da Universidade Nova de Lisboa – UID/LIN/03213/2019.

References

Aarts, A. *et al.* (2015). Estimating the Reproducibility of Psychological Science. Science. 349. 10.1126/science.aac4716.

Anthony, L. (2018). AntConc (Version 3.5.7). Tokyo, Japan : Waseda University. Retrieved from http://www.laurenceanthony.net/software/antconc/

ASRM. (1997). Revised American Society for Reproductive Medicine classification of endometriosis. Fertility and Sterility, 67(5), 817-821.

Baker, M. (2016). 1,500 scientists lift the lid on reproducibility. Nature 533, p. 452-454 doi :10.1038/533452a

Bornman, H. & von Solms, S. (1993), "Hypermedia, multimedia and hypertext : definitions and overview", The Electronic Library, Vol. 11 No. 4/5, p. 259-268. https://doi.org/10.1108/eb045243

Carvalho, Luiz *et al.* (2012). Single port laparoscopy. Fertility and Sterility, Volume 97, Issue 5, e17

Carvalho, S., Costa, R., & Roche, C. (2016). LESS Can Indeed Be More : Linguistic and Conceptual Challenges in the Age of Interoperability. In B. Erdman Thomsen, Hanne ; Pareja-Lora, Antonio ; Nistrup Madsen (Ed.), Proceedings of the 12th International conference on Terminology and Knowledge Engineering (p. 157-167). Copenhagen : Copenhagen Business School. Department of International Business Communication and Politics.

Carvalho, S. (2018). A terminological approach to knowledge organization within the scope of endometriosis : the EndoTerm project. PhD thesis. Faculdade de Ciências Sociais e Humanas – Universidade NOVA de Lisboa/Communauté Université Grenoble Alpes. Available at : https://run.unl.pt/handle/10362/49745

Costa, R. (2013). Terminology and Specialised Lexicography : two complementary domains. Lexicographica, 29(1), p. 29-42.

Costa, R. *et al.* (2012). Mediation strategies between terminologists and experts. In Proceedings of GLAT 2012 - Terminologies : textes, discours et accès aux savoirs spécialisés, Genova, p. 297-308).

D'Ockham, G. (1988). Somme de Logique. (Traduit du latin par J. Biard). Trans-Europ-Repress.

Dunselman, G. *et al.* (2014). ESHRE guideline : management of women with endometriosis. Human Reproduction, 29(3), p. 400-412.

Falcone, T. & Setúbal, A. (2013). JMIG Video Articles. Journal of Minimally Invasive Gynecology, Volume 20, Issue 3, p. 267.

Galinski, C., & Picht, H. (1997). Graphic and Other Semiotic Forms of Knowledge Representation in Terminology Management. In S. E. Wright & G. Budin (Eds.), Handbook of Terminology Management Volume 1 : Basic Aspects of Terminology Management. Amsterdam : John Benjamins Publishing Company, p. 42-61.

Gill, I. *et al.* (2010). Consensus statement of the consortium for laparoendoscopic single-site surgery. Surgical Endoscopy, 24(4), p. 762-768.

IHTSDO. (2018). SNOMED CT Editorial Guide. International Health Terminology Standards Development Organisation. Retrieved from https://confluence.ihtsdotools.org/display/DOCEG/SNOMED+CT+Editorial+Guide

ISO (2000). ISO 1087-1 : Terminology Work - Vocabulary - Part 1 : Theory and Application. Geneva : International Organization for Standardization.

ISO (2009). ISO 704 : Terminology work - Principles and methods. Geneva : International Organization for Standardization.

Madsen, B. N. (2016). The Use of Linguistic and Non-linguistic Data in a Terminology and Knowledge Bank. In Proceedings of the TOTh Workshop 2013 : Verbal and nonverbal representation in terminology, p. 1-22.

Meyer, I. (2001). Extracting knowledge-rich contexts for terminography : a conceptual and methodological framework. In Didier Bourigault, Christian Jacquemin, & Marie-Claude L'Homme (Eds.), Recent Advances in Computational Terminology. Amsterdam/New York : John Benjamins Publishing Company, p. 279-302. https://doi.org/10.1075/nlp.2.15mey

Nuopponen, A. (2011). Methods of concept analysis – tools for systematic concept analysis. LSP Journal, 2(1), p. 4-15.

Nuopponen, A. (2014). Tangled Web of Concept Relations. Concept relations for ISO 1087-1 and ISO 704. In Proceedings of Terminology and Knowledge Engineering 2014. Berlin.

Osler W. (1904). Aequanimitas with other addresses to medical students, nurses and practitioners of medicine. Blakiston, Philadelphia.

Picht, H. (1999). Einige Überlegungen zur nicht-sprachlichen Repräsentation von Gegenständen und Begriffen. Synaps, 3, p. 1-50.

Picht, H. (2011). Non-verbal graphic representation of concepts. In Ivanovo School of Lexicography : Traditions and Innovations. A Festschrift in Honour of Professor Olga Karpova. Ivanovo : Ivanovo State University, p. 220-236.

Porphyry. (2003). Isagoge. (Translated by J. Barnes). Oxford : Oxford University Press.

Prieto-Velasco, J. A. (2016). Depicting specialized concepts : strategies for the visualization of terminological knowledge. In Proceedings of the TOTh Workshop 2013 : Verbal and nonverbal representation in terminology, p. 37-50.

Roche, C. (2012). Ontoterminology : How to unify terminology and ontology into a single paradigm. In Proceedings of the Eighth International Conference on Language Resources and Evaluation (LREC-2012), Istanbul, Turkey, May 23-25, 2012. Istanbul : European Language Resources Association (ELRA), p. 2626-2630.

Roche, C. (2015). Ontological definition. In H. J. Kockaert & F. Steurs (Eds.), Handbook of Terminology - vol. 1, Amsterdam : John Benjamins Publishing Company, p. 128-152.

Santos, C., & Costa, R. (2015). Domain specificity : Semasiological and onomasiological knowledge representation. In H. J. Kockaert & F. Steurs (Eds.), Handbook of Terminology - vol. 1. Amsterdam : John Benjamins Publishing Company, p. 153-179.

Résumé

Les formes non verbales de représentation des connaissances sont devenues de plus en plus importantes en Terminologie, tant du point de vue théorique que méthodologique. Elles sont abondamment utilisées dans de nombreux domaines et en particulier en médecine et ce dès le début de cette discipline. Aujourd'hui, grâce aux progrès technologiques impressionnants réalisés dans le domaine de la santé, les ressources multimodales qui combinent textes, vidéos de haute résolution, ainsi que les animations 2D et 3D, font désormais partie de la médecine moderne où elles jouent un rôle central, en particulier dans les procédures médicales. Dans le cadre de cet article, nous nous sommes intéressés à l'une des ressources multimédias les plus récentes et les plus prometteuses, à savoir l'*article vidéo*. Un *article vidéo* est un article révisé et indexé qui comprend des éléments verbaux et non verbaux (par exemples, des narrations par des experts ou des vidéos d'opérations chirurgicales comprenant des séquences externes et internes) et, par conséquent, des formes verbales et non verbales de représentation des connaissances. Ces caractéristiques font des *articles vidéos* des ressources intéressantes à considérer dans une approche de la double dimension, linguistique et conceptuelle, de la Terminologie. L'analyse d'un *article vidéo* portant sur une intervention chirurgicale, la *laparoscopie* à des fins gynécologiques, permettra d'illustrer nos propositions.