MAPPING MEDICAL ACRONYMS[1]

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Abstract – Searches in the multimedia *House Corpus* reveal that, as well as a noun, the acronym MRI functions in the *House MD* series as an adjective and, albeit rarely, as a transitive verb and that, besides referring to equipment used in the MRI procedure and to the procedure itself, it is also used as a countable noun, often in the plural (MRIs), to refer to the scans so produced. By contrast, the entry in the online OED (Third edition) refers to MRI only as a noun and restricts its definition to a medical procedure and associated equipment. Given these characteristics, the *House Corpus* project has been an opportunity to investigate medical acronyms more completely and, in particular, to meet the challenge they represent for medical trainees when listening to spoken medical discourse. With the assistance of student annotators, every medical acronym in the *House Corpus* has now been indexed in terms of grammatical (countable/uncountable noun; adjective and verb) and functional categories (specific diseases; therapeutic/diagnostic procedures; equipment; test results; medical facilities, names of substances; anatomical parts and body states). Special care has been taken in the tagging process to include derivative and related forms (e.g. fMRI as well as MRI). As a result, the *House Corpus* now has a specific *Acronym Search* resource, a first step towards *Acronym Maps* that aggregate the various grammatical and functional categories into which a specific acronym falls. While a clear boon for medical English classrooms, such *Maps* support hunches about the nature and incidence of acronyms in spoken and written forms of medical discourse in English and, when compared to other languages such as Italian, highlight differences in abbreviatory strategies. The article concludes that greater consideration of specialised medical genres and contexts, especially those relating to spoken discourse, (Loiacono 2015, 2016, 2018) needs to be made in corpus studies than has been the case in the past.

Keywords: acronyms; acronym maps; abbreviatory strategies; spoken medical discourse.

1. Introduction

For students in their first years of medical studies in Italian universities coming to terms with the acronyms used in clinical care constitutes a problem. In fact, it would be more accurate to say that the problems acronyms constitute fall into a number of very different categories. The first of these relates to how best to learn them. Like it or not, learning acronyms is an essential part of the fluency in reading medical discourse in English that medical undergraduates are expected

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to achieve in their first years of university study. However, medical students, too, have their own expectations about the learning of acronyms, one of which is that their teachers, and not just teachers of medical English, should guide them as regards *which* acronyms should be learnt. In addition, medical trainees expect to receive advice on *how* to go about learning them. Alas, where available, such guidance is often unsatisfactory. Students' questions about whether it is best to learn acronyms by reading medical texts, by consulting online glossaries or by simply listening to classroom lectures and noting what acronyms are used are likely to go unanswered. This is because the processes that relate to the acquisition and use of medical acronyms are far more complex than would appear to be the case at first sight. They raise many learning issues that require considerable research.

SEASON: 1 - Episode: 17 - Role Model - Scene: 07

CAMERON: "Eastbrook Pharmaceuticals are pleased to announce that Dr. Gregory House will present the latest research on their exciting new **ACE** inhibitor."
CHASE: You're making that up. That's Vogler's company.
CAMERON: Press release. Doing an address at the North American Cardiology Conference. [Chase looks at the screen from behind Cameron.]
CHASE: House never gives speeches. [House enters.]
HOUSE: But when I really believe in something... Gosh dang it, I've got a chance to make a difference here.
CHASE: You made a deal with Vogler?
HOUSE: It's all the rage. Everybody's doing it. [Chase gives House a petty, pouty look and goes to sulk in a chair. Cameron walks over to House.]
CAMERON: So, what's the deal? You get to keep all of us if you plug his products?
HOUSE: One speech, no biggie. Foreman's doing a bone marrow biopsy to check for cancer.
CHASE: Cancer? The Senator's got **AIDS**.
HOUSE: Cancer sounds better on a press release. I need you guys to rush the **ELISA** test for **HIV**.

Figure 1
Acronyms with different forms and functions in a clinical context.

Ways of tackling the various issues are described below in relation to the ongoing development of a specialised acronym resource. Combined with the tools already available in the *House Corpus* interface (Taibi *et al. this volume*), this allows specific acronym searches to be made in the *House MD* TV series thereby providing a partial solution to some of the problems students face. The *Acronym Search* resource identifies scenes, such as the one shown in Figure 1, in which the searched-for acronyms are highlighted in red making them easy to distinguish. The current stage of development responds, in part, to some of the requests for assistance that students make, in particular thanks to the inclusion of a scene-by-scene link-up between the transcribed text and the corresponding video episode that provides students with an efficient way of hearing how these acronyms are pronounced. Thus, besides helping to distinguish between initialisms like HIV, pronounced letter by letter, and true acronyms modelled on pre-existing words like ACE and AIDS or names like ELISA, students now have a resource that allows them to acquire confidence in their ability to identify

acronyms in fast discourse – whether, for example, Dr. House is talking about EMGs (electromyograms) or ENGs (electroneurograms). The resource thus relieves the pressures on teachers mentioned above by providing a support for acronyms to be learnt in an online *self-learning* context. In theory, this encourages students to use contextual clues to figure out the basic function of an acronym even when they are unsure of its precise meaning – a matter which, despite the reassuring results described below, requires further assessment and more research.

Recognising acronyms *as* acronyms in both written and oral discourse is, indeed, less than half the battle for medical students. A second order of problems relates to acronyms' use and functions in medical discourse. This includes awareness of the constraints on using acronyms in oral and written discourse. The question – *What does LP actually stand for Lumbar Puncture or Lipoprotein?* – highlights the well-known problem of acronyms' ambiguity in medical contexts and the need to be able to identify and interpret their meaning readily (Pakhomov 2002). This much-debated feature in the medical and information technology literature (Berlin 2013; Kuhn 2007; Stevenson *et al.* 2009) includes the potential for errors to arise when, for example, doctors use an ambiguous acronym in medical notes without further specification or contextualisation (Parakh *et al.* 2011). This has led to claims that resolving acronyms' ambiguity is of paramount importance. However, while the perils of acronyms may be relevant in later years of study (for example, when learning to write research articles), the ambiguity issue appears to be overstated at least as far as initial medical studies are concerned. The analysis carried out in the construction of the *Acronym Search* resource (see *Section 3* below) revealed that very few of the acronyms used in the *House MD* series are, in fact, ambiguous and that context helps to clarify their meaning. Hence, rather than on constraints, attention in the early years of medical study should perhaps focus more on the affordances that acronyms provide in medical communication.

When asked to write a summary of a *House MD* episode in English and to practise their skills of abbreviation in English (see *Section 4*), students come to realise that there are crucial differences in the way 'English' medical acronyms are used in their mother tongue (mostly Italian for our students), and English discourse. When used in Italian medical discourse, English acronyms, such as CT or MRI, are grammatically invariable, whereas this is not the case in English. Figure 2 highlights the utterance "*ER CT'd him*" retrieved from the *House Corpus* using the *Acronym Search* resource, a striking example of abbreviation possible with acronyms in English but whose brevity and simplicity cannot be matched in Italian. Contrary to the frequent claims that full forms are preferable to acronyms (Baue 2002; Brubaker, Brubaker 1999; Kuhn 2007; Pakhomov 2002; Parakh *et al.* 2011; Patel, Rashid 2009, Pottegård *et al.* 2014; Summers, Kaminski 2004; Walling 2001), such examples suggest

that the acronyms used in English medical discourse are often *more*, rather than *less*, acceptable than the forms from which they are derived. The term *CT scan* appears in the *House Corpus* in 25 different scenes, but *Computed Tomography scan*, its multi-word source, never appears. Moreover, contrary to what is often assumed regarding acronyms' derivation from multi-word sources, there is no corresponding full form for the verb form *CT'd*. Had it existed, it would presumably have been **Computed Tomographied*, a rather awkward term to handle in both written and spoken discourse.

SEASON: 6 - Episode: 13 - Moving the Chains - Scene: 04

THIRTEEN: 22-year-old male – 6'7", 310 pounds. Clearly has brain involvement. [looking at the video of Daryl hitting himself] The guy has no recollection of this entire incident.
HOUSE: Football player. Those are the ones that get hit in the head a lot, right?
CHASE: **ER CT'd** him. No concussion, no stroke, no cortical degeneration.
TAUB: And he had a full psych evaluation. He's not crazy.
HOUSE: So it's roid rage. You don't think they grow them that big naturally.
FOREMAN: **ER** also tested for steroids. He's clean.
HOUSE: Only proving that our guy got his hands on the good stuff.
FOREMAN: The negative test at least means steroids is less likely. We should discuss other possibilities.

Figure 2
Acronyms support processes of metonymy and lexicalisation.

The frequency with which acronyms undergo metonymic processes is a further issue when attempting to master the abbreviation practices that underpin medical discourse. *ER* appears in many episodes in the *House MD* series (a total of 83 scenes). However, it is only through specialised corpora and thanks to corpus-specific annotations (see *Sections 2* and *4*) that medical trainees can ask and find answers for an all-important question – in what ways do the *uses* made of English acronyms in *Italian* medical discourse differ from those of the very same acronyms when used in medical discourse in *English*? For example, *ER* and *MRI* may, in medical discourse in English, be references to specific hospital facilities and their location in a hospital. They may also be references to these facilities' functions, which includes the services they deliver and, as Figure 2 shows, the staff who work there. Italian cannot abbreviate in *this* way. In Italian, it is necessary instead to spell out these different functions, possibly with a reference to *il servizio MRI* for the facility and to *gli addetti all'MRI* or *i tecnici dell'MRI* for the personnel. *Section 2* illustrates how specialised corpora can provide a useful way of addressing these issues, while *Section 4* describes how medical trainees can support efforts to master 'metonymic abbreviation' – essential for efficient medical communication in English.

A third type of problem relates to acronyms' use in digital texts. This has to do, in particular, with the skills required when attempting to retrieve data from digital databases and the degree to which abbreviated forms (acronyms in particular) can be used to this end. Like their counterparts in universities in other parts of the world, Italian medical students are given free access to digital

resources but many students are reluctant to use them. In the case of medical students, this is hardly surprising. In the early years of study, formulating questions in a clinical context is a major part of clinical training (see Loiacono 2018, pp. 691-695, for PICO questions in digital healthcare). The question – *Did a digital search miss out vital data?* – highlights the need to understand and successfully judge the probability that information has been missed owing to the way in which database queries are formulated. Formulating such queries in a way that is consistent with the medical tradition of question-formulation is a relatively new issue in medical training but is emerging as major requirement in Italy and elsewhere (Schultz 2006).

SEASON: 3 - Episode: 19 - Act Your Age - Scene: 08

FOREMAN: The stroke was caused by a clot in her middle cerebral artery. Started her on **TPA**. It should dissolve the clot and hopefully prevent brain damage, but we won't know for sure until she regains consciousness.
HOUSE: Or she has another stroke. Arthritis, heart disease, why can't this kid act her age?
FOREMAN: **JRA** doesn't affect the blood, means the clot's a symptom of something else. [Cameron walks in.]
CAMERON: It's a symptom of polycythemia, she's fully hydrated and her blood's still thicker than pancake batter.
HOUSE: Well thick blood explains the stroke, could also have caused an autoimmune response, which would explain the **JRA** kicking into gear. But what explains the thick blood?

Figure 3
Embracing variation from expected conventions in digital searches.

Once again, specialised corpora are – potentially – a way of sensitising students in their early years of study to the relevance of this tricky digital issue. As Figure 3 shows, through highlighting (and comparisons with other scenes), it is possible to encourage students to reflect on the diversity and variation in the process of abbreviating with its many subtleties (see also *Section 4*). The typical capitalisation of acronyms may help distinguish Dr. House's *ACE inhibitors* from his encounters with *ace attorneys* and his use of *PAS* to indicate *p-aminosalicylic acid* (*Scene 32, Episode 13, Season 8*) from those where he pretends not to be able to speak English (*je ne parle pas anglais*, *Scene 10, Episode 21, Season 7*) but, as Figure 3 illustrates, in the case of a transcriber's slip-up, breaches of the capitalisation rule come to be highlighted. Such examples help students to become aware of, and to anticipate, part-lower case, part-upper case acronyms, as well as further variants of such 'standard' hybrids – not just *tPA (tissue plasminogen activator)* but also partial acronym forms, such as *t-plasminogen activator*. Training students to *predict* typical patterns of word abbreviation is essential if they are to feel confident about their use of digital resources. The quality of the search queries they undertake will ultimately depend on their understanding of how rules about 'standard' conventions come to be broken.

All this points to the need for medical students to contemplate written, oral and digital discourse in their studies of acronyms as well as the lexicogrammatical, discourse and digital aspects of the process of abbreviation

in medical discourse in English. This article does not attempt to explore these issues individually. Rather our concern is with developing a *single* research, teaching and learning framework that potentially allows all aspects of acronyms to be addressed and which can be extended at a later stage of research to cover all aspects of abbreviation in clinical care. This will allow a better focus on abbreviation as a process to be learnt, taught and thoroughly practised within English for Medicine courses (*Section 4*).

By 'framework', we mean an online resource that can be used in specific teaching and learning contexts to underpin references to, and illustrations of, descriptive models of abbreviation in medical and scientific discourse. Indeed, the ultimate goal of the research is not to produce an interface that detects every acronym in a specialised corpus. Rather, it is to build a corpus resource that allows the issue of mastering the *functions* of acronyms in clinical discourse to be approached in a way that meets the demands in Italian universities of medical training in English. As explained below, the current project is a first step in this direction. Indeed, in order to function fully it will eventually need to take genre, and the relationships between acronyms and specific medical genres, as well as other issues into consideration, all of which is further discussed in *Section 4.*

2. Materials and Methods

The research so far undertaken is reported in summary form in this Section. It relates to the very first stages of annotation of acronyms in the *House Corpus.* With its customisable interface and scene-based indexing of scripted oral medical discourse of an entire TV series, the *House Corpus* (Taibi *et al.*, this volume) provides a suitable basis for the development of an online *Acronym Search* resource that identifies acronyms and illustrates their role in clinical discourse. In the first now completed stage of the research, manual annotation of all medical acronyms in the *House MD* TV series was undertaken. Given the project's initial focus on medical acronyms, the students who carried out the annotation (see *Acknowledgements*) were asked to exclude (a) abbreviations, except for part-acronym, part-abbreviation compounds (such as A-fib = atrial fibrillation) and (b) acronyms with no clear medical reference (e.g. LA = Los Angeles). For each transcript, a *Summary Table* was produced that established the type/token ratio for each episode. In addition, each transcript was annotated with the functional and grammatical tags reproduced in Tables 1 and 2.

TAG	DEFINITION OF FUNCTIONAL TAGS
1. BODY PARTS	A part of the human body e.g. CNS - Central Nervous System
2. BODY STATES	Refers *not* to a DISEASE but to the current *state* of *part* of a patient's body that is not functioning correctly, which has suffered a *lesion*.
3. DISEASES	Refers to the name of a specific disease.
4. FACILITY	The *place* where a procedure (diagnosis/therapy) is carried out or equipment used.
5. METATEXTUAL	Acronyms explained: e.g. *House: DNR means "do not resuscitate", not "do not treat".*
6. PROCEDURE	Unlike a specific DIAGNOSTIC TEST, this is used to describe an *action* to be undertaken, or one already completed; this label is usually associated with a U-NOUN as it is more abstract
7. SUBSTANCE	Typically a drug introduced as part of a therapy/test: e.g. IgG in immunoglobulin therapy
8. TESTS	A diagnostic test still to be done or test result for an already completed test

Table 1
Functional tags for House Corpus acronyms.

These Tables were part of a short manual that the annotators were given to guide their annotation. The annotations made by the students effectively tested out the validity of the acronym model submitted to them.

TAG	DEFINITION OF GRAMMATICAL TAGS
1. U-NOUN	UNCOUNTABLE NOUN as in *MRI stands for Magnetic Resonance Imagining*; *MRI works wonders*. You can't physically touch these MRIs or count them up … so no singular and plural difference exists; they are therefore uncountable. Another example is: *It's ALS.*
2. SC-NOUN	SINGULAR COUNTABLE NOUN e.g. *an MRI: he's a DNR* (…. *She's another DNR*…). NB. a U-NOUN often "becomes" an SC-NOUN when preceded by an article, number, possessive or demonstrative adjective: in e.g. *my ALS?*
3. PC-NOUN	PLURAL COUNTABLE NOUN e.g. *two MRIs*; they typically have a lower case *s*
4. ADJ	ADJECTIVE which precedes the noun it qualifies *e.g. a DNR patient*.
5. PRED-ADJ	PREDICATE ADJECTIVE: used after a verb e.g. he's DNR (NB. no *a/the* etc).
6. VERB	ANY VERB FORM: *He needs MRI-ing*; *she's been MRI-ed*; *I want to MRI him.*

Table 2
Grammatical tags for House Corpus acronyms.

The student annotators were given the opportunity to indicate their doubts. In particular, they were instructed to use the annotational label UNDECIDED to indicate those cases where an acronym appeared not to comply with the definitions given for the grammatical and functional model supplied. In fact, very few such cases were reported. When analysed, they highlighted uncertainties between categories – whether, for example, an acronym related to a PROCEDURE or a TEST. Most of these cases were subsequently resolved,

often by the student annotators themselves, by comparing other instances of the same or similar acronyms in the various episodes.

Other doubts related to the absence of certain acronym categories from the model, for example, relating to healthcare personnel (e.g. *EMT = Emergency Medical Technician*) and healthcare administration (*e.g. CDC = Centers for Disease Control*). The UNDECIDED annotation helped to identify and subsequently include the few instances of these categories that occur in the *House MD* series in the acronym *Search* list.

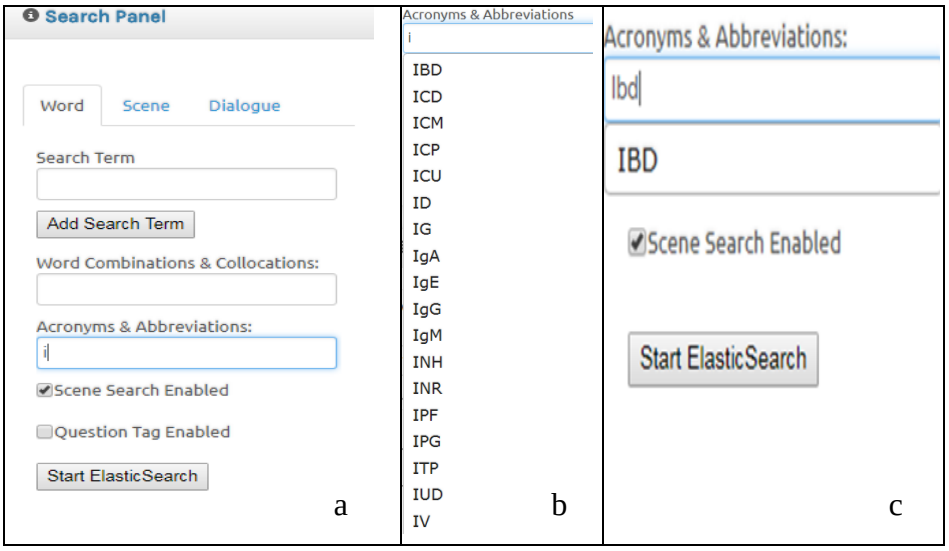

Figure 4.
Acronym searching: (a) list activation; (b) list restriction (c) item selection and search.

In this respect, as well as validating the acronym model, the work of annotation has also vindicated the choice of a TV series as a resource through which to engage with clinical acronyms. Certainly, medical opinion has long been divided on the clinical validity of TV healthcare – some supportive (e.g. Gordon *et al*. 1998), others more critical (Smith *et al*. 1972). However, the simulated hospital environment of the *House MD* series uses a large number of valuable clinical acronyms. Moreover, this TV series also prioritises clinical acronyms over other types of medical acronyms which is the reverse of what happens with many online medical acronym finders (e.g. *Acronym Finder: https://www.acronymfinder.com*) that prioritise healthcare personnel and administration acronyms over those relating to the diagnostic and therapeutic procedures that arise in a clinical context. As Figure 4 shows, the types of clinical acronyms found in the *House Corpus* are reassuringly those with which medical students need to engage.

The great care that the student annotators took needs to be mentioned. It was expected that undergraduate students in their early years of a language degree would make mistakes as regards the expansion of acronyms to their full

forms. There were, in fact, very few such cases. However, so far, neither the list of multi-word sources of acronyms (i.e. their full forms), nor the distribution across the corpus of the grammatical and functional properties of acronyms identified have been included in the *Search Panel* options of the *House Corpus* for reasons further explained in *Section 4*.

The second stage in the research consisted in the conversion of the 177 *Summary tables* thus created by the student annotators into a single table. From this, a *Search List* of acronyms was created that has been incorporated into the *Acronym Search* functionality, recently restyled as the *Acronym and Abbreviations* functionality, that is available in the *Search Panel* in the *House Corpus* interface. Figure 4 reconstructs the drop-down *Search Menu* used to make selections from this *Search List*; when a letter is typed into the search box, a list of acronyms starting with the corresponding letter appears; the typing of further letters, usually no more than two or three, further reduces the list until only one option remains, which can then be selected. Figure 5 shows how the *Search Result* functionality reports the number of search 'hits' for the query presented in Figure 4 (in this case two in the same scene).

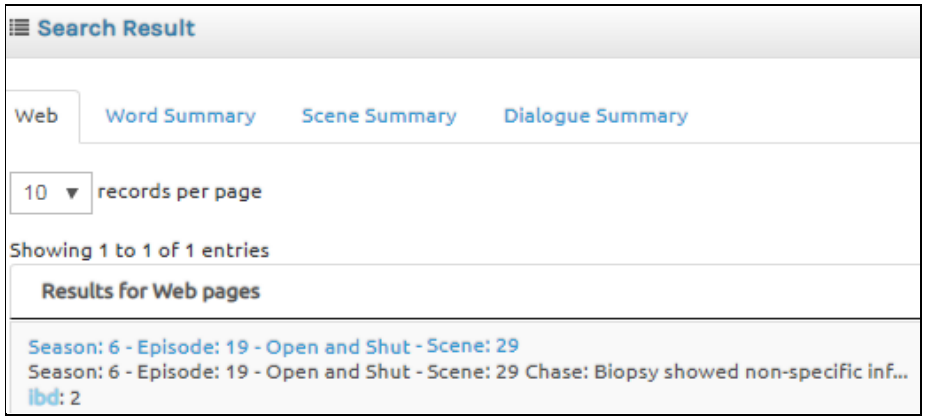

Figure 5
An example of the *Result Pages* of an acronym search.

Figure 6, instead, shows that clicking the hyperlink for a specific scene, Scene 29 in the example shown in Figure 5, ensures the written transcript is presented, accompanied by a scene viewing, with all instances of the searched-for acronym(s) highlighted. As many examples in this article show, the search possibilities include combinations with other words or acronyms. For example, selecting *ANA* from the acronym *Search List* and typing in *anti-DNA* in the *Word Combination & Collocations* box (Figure 4) returns a scene (not shown) where *anti-DNA* a.k.a. *anti-double stranded DNA* (*Anti-dsDNA*) *antibodies* are exemplified as a subgroup of *anti-nuclear antibodies (ANA).*

SEASON: 6 - Episode: 19 - Open and Shut - Scene: 29

CHASE: Biopsy showed non-specific inflammation, which suggests **IBD**, only it doesn't explain the cardiac problems.
TAUB: Or her declining kidney function. We ran panels during surgery.
HOUSE: Actually, **IBD** does make sense, 'cause it could trigger ankylosing spondylitis, which would explain the heart and the kidneys. Start her on sulfasalazine and **TNF** inhibitors. (They follow him in the corridor. House enters the elevator.) Oh, and Taub, I'm not gonna see you before you head off for Gomorrah. Just remember, if you get disoriented... breathe through your nose and look for the horizon.

Figure 6
An example of an acronym contextualised in a scene.

3. Results

Manual annotation revealed 324 different forms identified as medical acronyms (i.e. *types*) with a total of just under 3000 instances (i.e. *tokens*), a somewhat smaller figure than originally predicted. However, the online resource produced more occurrences than manual annotation as searches included the many examples in episode titles and stage directions and descriptions that students were instructed not to include in their annotation.

		Tokens	
Acronym	Full name	Manual	Online
5ASA	5-aminosalicylic Acid	2	2
B12	Cobalamin	1	14
B19	Buccal Neuron 19	1	3
BRCA1	Breast Cancer Gene 1	1	1
CA125	Cancer Antigen 125	2	2
CA19.5	Cancer Antigen 19.5	1	1
CD68	Cluster of Differentiation 68	1	1
CO2	Carbon Dioxide	1	1
FIO2	Fraction of Inspired Oxygen	1	1
Hba1c	Glycated Haemoglobin	2	1
MDR-1	Multi-Drug Resistance 1	1	1
NF2	Neurofibromatosis Type 2	8	8
O2	Oxygen	11	32
O2 sats	Oxygen Saturation	5	6
T2	Time for 63% of Transverse Relaxation	1	2
T3	Triiodothyronine (thyroid hormone)	1	1
T4	Thyroxine (thyroid hormone)]	3	3
		43	80

Table 3
Manual *vs.* online results for alphanumeric acronyms.

The higher number of tokens in online results was also due to more special circumstances. A small but significant percentage of clinical acronyms are alphanumerical, not all of them annotated owing to the insufficient initial

instructions given to the student annotators. Consequently, as Table 3 shows, for the 17 alphanumerical types identified, 43 tokens were annotated manually whereas 80 are returned by the online system.

Table 4 analyses acronyms' relative frequency in the corpus in terms of six frequency-related categories. As may be deduced from this, the vast majority relate to acronyms for which there is just one token in the corpus.

Category	Instances	Manual	Online
1	1	132	131
2	2-5	114	109
3	6-10	33	32
4	11-20	20	20
5	21-100	20	27
6	100+	5	5
Total		324	324

Table 4
Acronym Frequency per category.

Frequency is a crucial characteristic that the planned *Acronym Map* resource will take into consideration. Frequent acronyms pose different problems for students as compared with those that are less frequent. Thus, as stated above, *MRI*, the most frequent acronym in the corpus, can function as an adjective, noun or verb and can appear in inflected forms including prefixes (e.g. *fMRI*) or suffixes (e.g. *MRIs*) and can refer to a facility, procedure and as an adjective in multi-word combinations. *MRI* can also indicate test results or, collectively, refer to those who turn an MRI facility into a service. By contrast, at the time of writing, the entry in the online OED (Third edition) refers to *MRI* as a noun, but not to other parts of speech, and limits its definition to a medical procedure and associated equipment. Certainly, the OED's description of *fMRI* (*functional magnetic resonance imaging*) as a noun and adjective used to describe a medical procedure and the associated scan it produces is more comprehensive. The line *fMRIs tell us where the blood flow is* (*Scene 13, Episode 8, Season 5*) certainly indicates that the same inflectional processes that occur with *MRI* also occur with *fMRI* but none of the scenes where *fMRI* is referred to in the *House Corpus* illustrate the metonymic processes that have affected *MRI*. Inevitably, the planned *Acronym Map* resource will need to incorporate other sources that illustrate just how far these processes extend to *fMRI* in English and Italian discourse.

On both manual and online counts, over three-quarters of the acronyms occur only five times or less in the corpus. Many of these, terms like *IBD* (*inflammatory bowel disease*), occur in just *one* scene raising the question as to whether students should be required to learn terms that only appear once. As it happens, the IBD acronym was part of a survey of twenty frequent gastrointestinal acronyms sent to all medical house staff and attending

physicians in New York with a request to provide the full forms. This survey led the researchers to conclude that, "awareness of medical acronyms was less than acceptable" (Parakh *et al.* 2011, p. 9) since, gastroenterologists excluded, many of those asked were unable to give the correct reply. Such experiments clearly point to the need for acronym training and suggest that the thorough learning of all 300 or so acronyms present in the *House Corpus* constitutes a good investment for medical undergraduates.

Despite there being no *must-be-learnt* list of English medical acronyms for students in their pre-clerkship bioscience years, other ways of validating the *House Corpus* as a source of essential acronyms exist, one of which is to compare it with expectations about acronyms for the *USMLE Step 1* exam (www.usmle.org/step-1/), which assesses the first steps in medical studies. "Constructed according to an integrated content outline that organizes basic science material along two dimensions: system and process" it, alas, presents no to-be-learnt list of acronyms. However, the many *what-to-expect-in-USMLE-Step-1* primers available come close to doing so, as they contain lists of 'Common abbreviations' needed to pass the exam, which thus constitute a useful benchmark when evaluating acronyms for medical trainees. There are sufficient correspondences between *USMLE Step 1* and the levels of knowledge required of Italian students in their first years of studying Medicine to conclude that validating our acronym list in this way works.

T2	**TID**	**TPP thiamine pyrophosphate**
T3	**TIPS**	**TPR total peripheral resistance**
T4	**TM**	**TRH thyrotropin-releasing hormone**
TAL	**TMS**	**tRNA transfer ribonucleic acid**
TB	**TNF**	**TSH thyroid-stimulating hormone**
TBI	**tPA**	**TTP thrombotic thrombocytopenic purpura**
T-cell	**TPP**	
TEE	**TRH**	**TXA_2 thromboxane A_2**
THC	**TSH**	
TIA	**TTP**	
TIBC		

Figure 7
Side-by-side comparison of acronyms in the House Corpus and an USMLE Step 1 primer.

Thus the left-hand side of Figure 7 shows the list of 21 acronyms for the letter T in the *House Corpus*. The right-hand side of Figure 5 instead shows the seven 'Common abbreviations' for the letter *T* (all of them acronyms) from one such primer (Reinheimer 2005, p. xviii). Of the latter, four also occur in the *House Corpus* (TPP, TRH, TSH, TTP), suggesting that, although, as mentioned above, some integrations from other sources may be needed, the acronyms in our list do stand up to scrutiny.

We may conclude this Section by underscoring the fact that an *Acronym and Abbreviations* resource has been created that allows students to learn

acronyms in context. It can be used in conjunction with online tests (e.g. implemented through *Google Forms*) to encourage individual use in self-learning activities. Further improvements are planned such as enabling users to switch between an *acronym-only* version (e.g. *MRI*) and a version that includes reference to the multi-word source (i.e. stating that *MRI* refers to *Magnetic Resonance Imaging*). Others, such as the highlighting of *all* the acronyms in a specific scene, red for those searched-for but blue for the others, have already been undertaken as illustrated, for example, in Figures 3 and 6. However, the implementation of *Acronym Maps* is still some way off.

4. Discussion

As stated in the *Introduction*, clinical acronyms must be learnt in the early years of medical training. Figure 8, taken from a US website (http://tmedweb.tulane.edu/portal/student-guide/item/medical-terminology-and-abbreviations?category_id=20) with "the mission of providing our student community a website that brings together various facets of medical school", neatly summarises the reasons why medical students in their pre-clerkship years should invest in learning abbreviations.

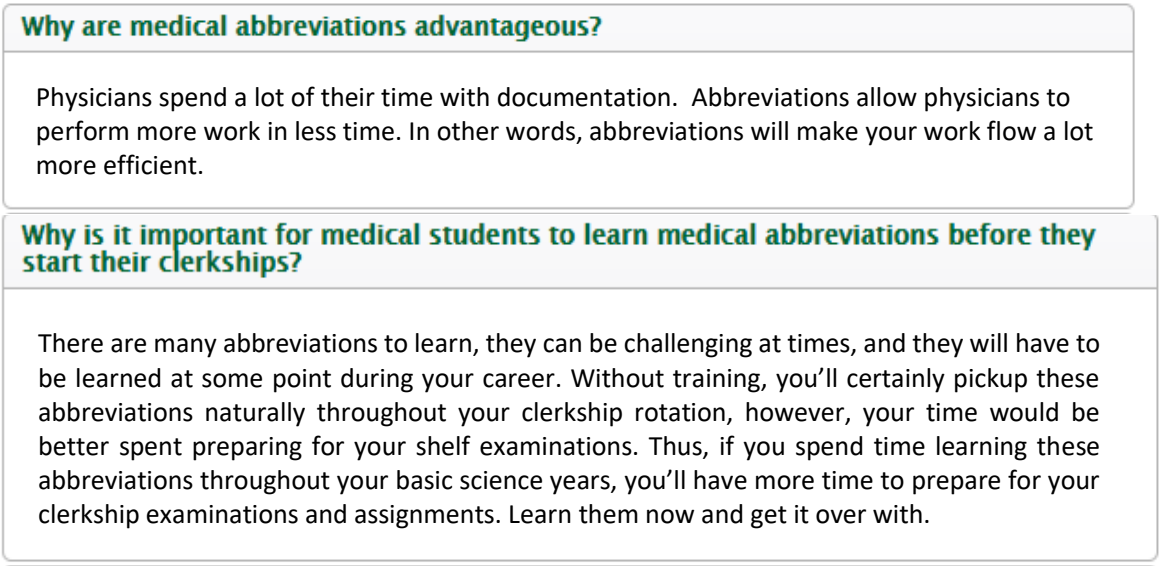

Figure 8
Learning medical abbreviations within a preparatory philosophy.

In an Italian context, the one for which the *Acronyms and Abbreviations* resource in the *House Corpus* is being developed, clerkships or rotations also occur. University administration describes them as *AFP Attività formative professionalizzanti* but they are referred to informally as *tirocini pre-laurea* and the students who participate in them as *tirocinanti.* As in other medical training

systems, *AFPs* are the first taste medical trainees have of working in a hospital setting.

As Figure 8 explains, after learning basic biomedical science, and as they approach the midway point in their degree course, medical trainees will spend an increasing amount of time learning the ropes in hospitals, 'rotating' through different medical specialties under the guidance and supervision of hospital doctors. In so doing, they learn how to treat and interact with patients by taking patient histories, carrying out physical examinations, completing questionnaires, writing up progress notes and taking their first steps in clinical training by watching what their supervisors and other hospital staff do. As the *House MD* TV series simulates many of these activities, the *House Corpus* with its scene-based structure (Taibi *et al.*, this volume) is potentially a good way to present the preparatory training advocated in Figure 8, whether in classroom lectures or online self-learning activities. Simulation characterises much medical training (Loiacono 2018, pp. 246-252) and, as in the case in question, provides an empirical basis on which a theoretical framework can be mapped.

For Italian medical students, however, there are other reasons why these acronyms must be learnt and taught, in particular in the context of the compulsory courses in English that medical students follow. Italian is one of the world's languages, which translates English medical acronyms less often than others (Gavioli 2005, pp. 92-94; Laviosa 2017, p. 20). Thus, while Italian typically uses the acronym *BPCO* (*Broncopneumopatia Cronica Ostruttiva*) which corresponds to *COPD* (*Chronic Obstructive Lung Disease*), it also refers to the *GOLD* (*Global Initiative for Chronic Obstructive Lung Disease*) guidelines for its assessment and the compound *GOLDCOPD* which appears in the official Italian website for the disease: *http://goldcopd.it*. Likewise, whereas most Romance languages use *SIDA*, formed from the initial letters of the full expression that has been used to translate this syndrome from English into many Romance languages (such as French, Spanish, Portuguese and Romanian), Italian, instead, adopts the English acronym: *AIDS.* There are, of course, many cases where Italian will avoid the use of an acronym altogether, preferring to talk about *immunodeficienza* – in other words, resorting to the use of part of the multi-word source as a very different but useful abbreviatory strategy.

Cos'è l'esame PSA? Il PSA (dall'inglese Prostate-Specific Antigen, ossia antigene prostatico specifico) è una proteina prodotta dalle cellule della ghiandola prostatica. L'esame ne misura i livelli nel sangue.
https://www.farmacoecura.it/tumore/valori-psa/
Il **PSA -** acronimo di ***Prostate Specific Antigen***, italianizzato in Antigene Prostatico Specifico - è una proteina sintetizzata dalle cellule della prostata. Piccole concentrazioni di antigene prostatico sono normalmente presenti nel siero di tutti gli uomini e si possono valutare tramite un semplice esame del sangue.
http://www.my-personaltrainer.it/salute/psa.html

Figure 9
Glossing the acronym PSA.

As Figure 9 shows, many online glossaries for the Italian general public exist that 'convert' English medical acronyms into their corresponding full forms in both Italian *and* English. So why bother about teaching acronyms? Are online glossaries not enough? In answer to these questions, the example shown in Figure 9 has not been chosen by accident. Reportedly, in the university where the author of this Section currently teaches, a senior academic asked a candidate to explain the meaning of this acronym during the medical student's final exam. Receiving no answer, the academic had to explain its meaning to the student. Even if a single instance is judged not to be sufficient justification for specific training of clinical acronyms, the authors' experience is that this is not the only example. What counts is the cumulative effect. Besides this, there are, in any case, other justifications relating to the need to transcend the lexicogrammatical aspects of acronyms and contemplate their discourse and digital aspects, described in the *Introduction*, that glossaries and other tools (such as those mentioned in the *tmedweb.tulane.edu* portal) do not – and probably cannot – contemplate.

What is of interest to teachers whose professional duties are to research and teach medical discourse in English is the potential of a specialised corpus based on scripted clinical discourse to illustrate the genre-related and sociolinguistic characteristics of acronyms, an important aspect of what, for want of a better label, may be termed 'clinical interaction theory'. Indeed, in the course of their clerkships, medical trainees will encounter medical, and above all clinical genres, many of which need to be understood and practised. The different uses to which acronyms are put are closely tied to specific medical genres. Within the preparatory and anticipatory learning context envisaged above, the corpus-based approach outlined in the previous sections seems to be a good solution for the contextualised learning of specific clinical acronyms, where 'contextualised' underscores their genre-related nature. This is the step that the planned *Acronym Maps* needs and intends to undertake.

Ironically, and somewhat paradoxically, it is precisely the confusion that surrounds the use of acronyms – the acronym soup often wittily served up in medical literature (Walling 2001, p. 14) – that constitutes a sound basis for persuading students to consider the status of medical acronyms in English as a discourse and genre-related problem rather than as a language problem.

Comparing examples from clinical manuals allows students to focus on the functions of clinical acronyms and not just on the forms they take. The text shown in Figure 10 is a passage from a volume on Emergency Medicine (Jenkins, Braen 2005, p. 6) for which an Italian translation has been published (Braen 2015, p. 4) and from which the text in the bottom part of Figure 10 has been taken.

One must remember that 1 to 2 minutes is required for medications administered at a peripheral site to reach the heart; this is true even when CPR is adequate. Most authorities therefore recommend that drugs be administered by rapid bolus and followed by a 20-mL bolus of fluid. When venous access is unobtainable, the following medications can be administered by endotracheal tube: lidocaine, epinephrine, atropine, and narcan (LEAN), which are administered in approximately 2- to 2.5-times the recommended dose, first diluted in 10 mL of normal saline, and injected by passing a catheter beyond the tip of the endotracheal tube. After injecting the medication, 3 to 4 forceful ventilations are provided.
• Occorre ricordare che sono necessari da 1 a 2 minuti affinché un farmaco somministrato in una zona periferica raggiunga il cuore anche nel caso in cui la CPR sia adeguata. • I farmaci vanno somministrati in bolo rapido seguito da un bolo di 20 ml di liquido. • Quando l'accesso venoso non è ottenibile i seguenti farmaci possono essere somministrati attraverso il tubo ET: lidocaina, adrenalina, atropina e naxolone LEAN (Lidocaine, Epinephrine, Atropine, Naxolone) somministrandone la dose consigliata in circa 2-2,5 volte, dapprima diluita in 10 ml di soluzione salina e quindi iniettata introducendo un catetere oltre l'estremità del tubo ET. • Dopo aver iniettato il farmaco si effettuano 3-4 ventilazioni forzate.

Figure 10
Glossing acronyms.

In keeping with the need for efficiency in Medicine described in Figure 8, the Italian text in Figure 10 underscores the need for straightforwardness in this medical specialty, in particular the need to give clear directions. It uses abbreviatory devices – bulleted presentation; omission of superfluous details such as "most authorities therefore recommend"; reduction of the English term *endotracheal tube* to the form *tubo ET* (where *ET* stands for *tubo endotracheale* i.e. *endotracheal tube*) – that shorten and sharpen the original text. All this is in addition to the abbreviatory devices used in the English text, as exemplified in both texts in Figure 10 in relation to the *CPR* procedure, a classic example of an acronym borrowed from English and used throughout Italian society in all healthcare-related services.

Note, however, the use of the term *LEAN* in Figure 10 both in the English and Italian texts to refer to a *group* of different entities in contrast to the common assumption that acronyms refer to a single entity. Indeed, leaving aside the difference in the English and Italian interpretation of N (*narcan* is the trade name; *naxolone* the name of the molecule), the term LEAN deserves a closer look. In *research articles*, it is described as an *acronym* (e.g. De Luca 2011, p. 681), but as a *mnemonic* in *manuals* (e.g. Davies, Hassell 2007, p. 14) and *handbooks* (e.g. Hughes, Mardell 2009, p. 462) and as a *mnemonic acronym* in *dissertations* (Bortle 2010, p. 158) – a demonstration, if ever one was needed, of the genre-based use and interpretation of medical acronyms.

How otherwise can the different name given to the very same term be explained, in particular when the authors took great in categorising their use of the LEAN abbreviation? The answer to the conundrum – *when is an acronym not an acronym?* – lies, of course, in the different uses to which it is put. In the case of the LEAN abbreviation, it is interpreted as a mnemonic in handbooks and manuals mindful of *don't-forget-to* clinical procedures but as an acronym where reflection on entities, as in research articles, predominates. In different clinical contexts and in different genres, mnemonics, like acronyms, undergo different degrees of formal and informal recognition and authorisation and hence transformation in their use, which students need to be made aware of. Every acronym has in theory the potential to become a mnemonic, and every mnemonic has the potential to become an acronym. Most will not exploit this potential, but some will, so that students need to be advised to look on the definitions given in dictionaries, such as those from the OED reproduced in Figure 9, not as watertight categories but as starting points in need of further refinement.

Acronym orig. *U.S.* **1.** A group of initial letters used as an abbreviation for a name or expression, each letter or part being pronounced separately; an initialism (such as *ATM*, *TLS*). 2. A word formed from the initial letters of other words or (occasionally) from the initial parts of syllables taken from other words, the whole being pronounced as a single word (such as *NATO*, *RADA*).
Mnemonic *n.* [..] 2 A device to aid the memory; (in later use) *spec.* a pattern of letters, ideas, or associations which assists in remembering something.

Figure 9
The online OED's definition of acronym and mnemonic.

Table 5 is what the author of this Section presents to her students as a way of underscoring the need to consider abbreviatory devices, regardless of whether they are formally known as acronyms, mnemonics, acrostics or something else, in terms of the actual functions they carry out, and, in particular, in relation to clinical genres and to those – doctors, healthcare workers, patients, researchers and others – who take part in clinical discourse. When medical acronyms are explicitly linked to the genres they enact, it becomes far easier to subcategorise their various forms. Most obviously, Table 5 makes use of functional labels that distinguish clearly between an entity and a procedure. This equips students with a device – the question probe – to decide whether in a particular clinical context a form is used to abbreviate (i.e. as an acronym) or to recall (i.e. as a mnemonic), in keeping with the dictionary definitions of these terms shown in Figure 9.

	Self-discourse	Doctor/HCW-patient discourse	Clinical Team/Trial discourse	Public Health discourse
PROCEDURE	Personalised Mnemonics	Questionnaire/Report Mnemonics	Checklist Mnemonics	Protocol Mnemonics
ENTITY	Personalised Acronyms	Medical Reports & Notes	Research Article/Clinical Trial Acronyms	Protocol Acronyms

Table 5
Acronym categories in clinical discourse.

Table 5 is also a starting point for the yet-to-be completed incorporation of the grammatical and functional tags of all the acronyms in the *House MD* series, already accomplished by student annotators and described above in *Sections 1* and *2* and which will be part of the planned *Acronym Maps* functionality. Details of how this can be achieved will need further discussion that takes various issues and considerable experimentation into consideration. One such possibility relates to incorporating online question probes in the exploratory form of a drop-down list of questions of the type: *What examples of Checklist Mnemonics exist in the House Corpus?* or *Does a Checklist Mnemonic ever appear in Doctor-Patient discourse in the House Corpus?* or even *Do acronyms used to describe Body States occur more frequently in Doctor-Patient discourse or in the discourse between Dr. House and his team*? As well as producing specific answers in the form of corpus 'hits', such probes can also help students appreciate the need for context to be taken into consideration and the need to reflect on the specific medical genres in which they are likely to occur. All this helps trainee doctors appreciate that, when experienced medical writers raise concerns in their discussions about the use of acronyms and mnemonics, their arguments are undermined when no reference to the genre(s) in which they are being used is made.

How do *question probes* link up with the categories described in Table 5 and with the idea of creating an *Acronym Map* functionality? In this respect, one such question probe might be *Is the term HIV an abbreviation for an entity or a mnemonic for a procedure that needs to be undertaken?* On the basis of the definition shown in Figure 9, the answer is, of course, that, as a pathological condition, it is an entity. However, when the same question is applied to the term *ABC* it is clear that the latter is a mnemonic as it fulfils the basic characteristic of all mnemonics in their role as a memory device. That is, mnemonics make explicit reference to an internalised checklist, listing the individual items to be performed in a procedure in a specific order. A mnemonic invites the user to pick out, perform and mentally tick off each item before proceeding to the next on the list.

The text in Figure 10 reconstructs this procedural aspect in a way that makes the ABC mnemonic's untrustworthiness explicit. Alas the writers of this text misleadingly describe the term 'ABC' both as an acronym and as a

slogan rather than as a mnemonic (current author's underlining). When they used the term 'slogan', they were, in fact, just one step away from providing a genre-referencing term of the type presented in Table 5. As illustrated below, most of the terms used in Table 5 *do* appear in the medical literature. Indeed, had the text in Figure 10 used the term *slogan mnemonic(s)* in criticising Public Health campaign slogans, it would have connected up with other instances and made its authors' arguments more powerful. Indeed, the criticism of the false reassurances that Public Health *slogan mnemonics* generate is not confined to the text in Figure 10. It resurfaces in other healthcare texts (see Loiacono 2018, *Chapter 11* for *Médecins sans frontières*' criticisms of the slogans used in the UN and WHO's promotion of the SDG and MDG programmes).

> Today's most commonly cited acronym for HIV prevention – "ABC" – falls severely short of describing the global effort needed to reduce HIV transmission. First, the ABCs mix up different prevention strategies. "A" (for abstinence) and "B" (for be faithful) are behaviors. "C" (for condoms) is a commodity. The implication of this string of concepts is that anyone can achieve protection if he or she chooses one or more options from the short menu. [….] The "alphabet soup" approach overlooks interventions needed to protect people in risk-filled environments such as prisons or refugee camps. The ABCs infantilize prevention, oversimplifying what should be an ongoing, strategic approach to reducing incidence. True, the simplicity of the ABC slogan has probably helped some people better appreciate that they can take basic steps to protect themselves from HIV infection. But that advantage must be weighed against the dangerously misleading messages the ABCs send to both individuals and to policy makers. "ABC" gives the incorrect impression that all HIV transmission is sexual and that effective prevention is simply a matter of changing the individual choices of millions of people with a few, tried and true interventions. Reciting The "ABCs" invites distracting and useless arguments, such as whether abstinence is better than partner reduction or both are better than condom use […] The alphabet soup approach ignores core components of a comprehensive prevention response and the critical importance of adapting programming to distinct epidemics. Key aspects of prevention programming are invisible in the ABCs. In Eastern Europe nearly two thirds (62%) of new HIV infections reported in 2006 were due to non-sterile injection drug use. (Collins et al. 2008:)

Figure 10
Acronyms and dangerously misleading messages.

As the text shown in Figure 10 is not addressed to *intra-hospital* clinical care, it will not respond to the question probe – *is this abbreviation a clinical entity or a clinical procedure?* It nevertheless represents a useful starting point as regards the need to go beyond mere knowledge sharing as it considers trust and reassurance in medical discourse as significant in all aspects of medical discourse, an aspect in which the *House MD* TV series excels.

The categories established in Table 5 need to be briefly described. Though traditionally labelled as an acrostic, the term *personal memory device* (or PMD) used in Table 5 seems more appropriate as it is essentially a way of checking that nothing has been left out in the answers given in clinical exams. Unlike other categories, they are personal and not intended to be shared with others, though many successful doctors are keen to hand down to students the PMDs they themselves invented as trustworthy devices to pass exams in their student days. The example in Figure 11, with the PMD shown in brackets and 'indexed' with an icon, is from Reinheimer (2005, p. 16).

What three muscles constitute the erector spinae?	1. **I**liocostalis 2. **L**ongissimus 3. **S**pinalis ("**I L**ove **S**cience" muscles) 

Figure 11
Mnemonics Medical Trainees use as checklists in exams.

While personalised abbreviations are not designed to be shared, the evidence from online clinical blogs, forums and associated threads shows that they *are* assumed to exist.

For Goodness Sake - stop using personal acronyms

This was the transfer note for a patient. Please, if you use acronyms like these, just stop! Take the extra second and type it out.

Following SBAR format report given to Charge Nurse SBAR report
S- Situation (describe the condition of patient): Pt was admitted for Upper GIB, received 2 units of PRBC and 1 L of NS in MICU. HCt 19->23. Hemodynamically stable. BP 120-130s/60s, SR 70s-80s. Satting 98-100% on RA. LS clear t/o. Abd snt,BT x4. BM today, dark green/melena soft formed medium. Edema to BL LE +3 L>R. PPP+. BG before lunch, SS as ordered, MD ordered.
B- Background (concise/pertinent history of patient): See problem list and ICU/Pulmonary notes.
A- Assessment (your conclusion of patients condition now): Pt is hemodynamically stable. HCT. No c/o syncopy, SOB, CP, n/v/d. Able to transfer from bed to commode w/ stand by assit only and ambulate for short distance in room.
R- Recommendation (what needs to be done for/with the patient when they get to new location?): Transfuse 2 units PRBC as ordered at 1200. Please discusss with MD, higher insulin coverage for noon CS, SS 5 units administered as ordered. Monitor for s/sx of bleeding. CS check q AC &HS.

Comment thread [selected items]

- Acronyms like which? On first read I don't see any that are new to me.
- As I was reading it I kept saying to myself what personal acronyms? Then I got down to the comments and saw this was the consensus thoughout. That made me pretty happy because I have only been an RN for 4 months so I thought maybe I am missing something.
- Glad to know I'm not the only one without a problem reading this...
- What acronyms are bugging you? This read very easily to me. The acronyms used here are used at both hospitals I work at?

https://www.reddit.com/r/nursing/comments/1z8boj/for_goodness_sake_stop_using_personal_acronyms

Figure 12
Personal acronyms: how standard are they?

As the text in Figure 12 demonstrates, this awareness of their existence often surfaces in medical discourse where the boundary between shared and unshared gets blurred typically where outsiders complain about 'personal acronyms' that insiders consider as shared conventions.

The example and *Comment Thread* reproduced in Figure 12 makes it clear that in clinical practice agreements about what can be used and what cannot be used are based on consensus and experience rather than on formal agreements. The text, some parts of which have been omitted but which has

otherwise been reproduced in its original form, implicitly illustrates SBAR's transition from mnemonic to genre status. The *Comment Thread* section shows readers have no trouble with the acronyms used because of their familiarity with, and experience of, the *SBAR format report* (i.e. a genre). SBAR belongs to the second category in Table 5, the one in which doctors and other healthcare workers (HCWs) write reports about individual patients, sometimes as a result of questionnaire-based interactions with their patients. While outsiders or trainees will, of course, have difficulty with this genre, it needs to be recalled that *SBAR* is one of the commonest written 'mnemonic' genres, so well known that it has influenced the development of oral mnemonics such as I-PASS designed to prevent miscommunication in handovers (Starmer *et al.* 2012, p. 201).

Consensus is thus a vital aspect of acronym use. What *can* and *cannot* be used has been established by the *JOINT COMMISSION* considered by many to be the final arbiter. Its website (www.jointcommission.org/) explains that apart from those on a short list of unacceptable abbreviations, any reasonable standardization of abbreviations, acronyms, and symbols is acceptable and also holds (third bullet point in Figure 13) that personal acronyms are by no means automatically disbarred.

Abbreviation List – Options

Is a list of acceptable abbreviations required? No. The requirements found at IM.02.02.01 do not require organizations to maintain a list of acceptable abbreviations. Developing and maintaining a list of acceptable abbreviations would be an organizational decision. IM.02.02.01 EP 2 requires that organizations use 'standardized' abbreviations. Any reasonable approach to standardizing abbreviations, acronyms, and symbols is acceptable. Examples may include:

- Standardized abbreviations developed by the individual organization.
- Use of a published reference source. However, if multiple abbreviations, symbols or acronyms are used for the same term, the organization identifies what will be used to eliminate any ambiguity.
- A decision that individuals who work in the organization may use any abbreviation, acronym, or symbol that is not on the list of unacceptable abbreviations. However, if multiple abbreviations, symbols, or acronyms exist for the same term, the organization identifies what will be used to eliminate ambiguity.

Figure 13
Personal acronyms: how standard are they?

We may note in passing that their control on naming processes is far less than that carried out by *The United States Adopted Names Council* (*USANC:* www.ama-assn.org/about/united-states-adopted-names-council). This latter agency approves generic names for drugs, and hence abbreviations, in the US (Loiacono 2013b, pp. 31-32). On the contrary, besides inviting users to suggest acronyms to be added to their list, the *FDA (US Food and Drug Administration*) goes no further than providing a list of them stating that:

> "The emphasis is on scientific, regulatory, government agency, and computer application terms. The database includes some FDA organizational and program acronyms".
> *www.fda.gov/aboutfda/fdaacronymsabbreviations/default.htm*

The transition to clerkship is inevitably a moment of truth when cultural assumptions about acronyms and mnemonics come to be scrutinised. Mnemonics and acronyms that are part of a clinician's PMDs have the habit of slipping out and causing consternation and surprise. A question probe of the type suggested above might take the following form: *Are personal abbreviations ever used or contested in clinical contexts?* This would lead to the scene in *House MD* shown in Figure 14 (one of seven scenes in this series where mnemonics are discussed) and would function at the very least as a basis for further discussion about the sociomedical functions (disruptive or constructive?) of personalised uses of abbreviatory devices.

SEASON: 3 - Episode: 13 - Needle in a Haystack - Scene: 10

FOREMAN: (puts up x-ray) Take a look at this. Bones of your forearm.
STEVIE: Uh. Radius and ulna.
FOREMAN: How about the wrist?
STEVIE: Um. Lunate. Hamate, The...
CAMERON: Scared lovers try positions they can't handle. (Foreman and Stevie look at her) It's a **mnemonic** for the wrist bones. It's the only way I can remember them.
STEVIE: Ow.

Figure 14
Personalised mnemonics.

A medical trainee's first real taste of English abbreviations used in Italian clinical care are those indicated in the second column of Table 5. They arise in the context of questionnaires used in doctor-patient interviews. Although the term *questionnaire* appears just once in the *House Corpus*, student encounters with patients are well represented and include encounters with elderly patients, among the most frequent types of patient interview that medical trainees perform. *Monitoraggio e valutazione delle ACTIVITIES OF DAILY LIVING* (www.tlc.dii.univpm.it/blog/wpcontent/uploads/2014/10/ADLs_per_Sito.pdf), is the part English, part Italian title of an online teaching document by Susanna Spinsante, Università Politecnica delle Marche, illustrating the questionnaires that students use in these encounters. The document describes them in Italian but with constant reference to partly translated, partly untranslated documentation in English. We will not explore the various aspects of these questionnaires – *ADL (Activities of Daily Living), IADL (Instrumental Activities of Daily Living), MMSE (Mini Mental State Examination)* – that test a patient's autonomy cognitively and physically, except to further characterise the second column in Table 5. In this context, the medical trainee looks on these terms as entities and not as procedures. As the answer to each step is recorded, the trainee is guided by the printed or electronic questionnaire as regards the steps to be undertaken. While the term *questionnaire acronyms* is well established in the

medical literature (Cleemput, Dobbels 2007; Forsén *et al.* 2007), the author of this Section has yet to find a convincing example in the medical literature of the term *questionnaire mnemonics* during such interviews, a matter that has generated considerable discussion with students.

The contrary is true with the next category (Column 3 in Table 5) which indicates the explicit recognition in the medical literature of *checklist mnemonics* as exemplified by the text in Figure 15. This text recognises the value of a *mnemonic checklist* (current author's underlining) in stressful clinical contexts, and the usefulness of a specific mnemonic in reducing clinician error and promoting awareness among medical students.

> Metacognition is a cognitive debiasing strategy that clinicians can use to deliberately detach themselves from the immediate context of a clinical decision, which allows them to reflect upon the thinking process. However, cognitive debiasing strategies are often most needed when the clinician cannot afford the time to use them. A mnemonic checklist known as TWED (T = threat, W = what else, E = evidence and D = dispositional factors) was recently created to facilitate metacognition. This study explores the hypothesis that the TWED checklist improves the ability of medical students to make better clinical decision […] it is a predecided measure that allows the automatisation of goal intentions even in unfavourable environments (e.g. a busy and stressful environment). For example, if the intended goal is to minimise diagnostic errors secondary to cognitive biases, the implementation intention could be the use of a mnemonic checklist, like the TWED checklist, which is memorable and easily retrievable.

Figure 15
TWED a Mnemonic checklist Chew *et al.* 2016, pp. 694-697).

Often invented and shared by specific clinical teams, *checklist mnemonics* are a preventive measure countering tiredness, encouraging focus and detachment from the distractions in a hospital environment and stimulating teamwork. It is thus hardly surprising that checking lists is a major part of medical training and practice, a matter constantly foregrounded in the *House MD* series and indeed many other TV medical soaps.

It is never too early to make students aware of the power of abbreviations to persuade (Loiacono 2013a) which includes the downsides of an abbreviatory device like a *mnemonic checklist* which attribute enticing and even amusing names to clinical trials but which can sometimes hide more sinister realities. The sociolinguistic and psycholinguistic aspects of acronyms in clinical practice, specifically in randomized trials, are highlighted in the text in Figure 16, (current author's underlining). As well as establishing the continuities between acronyms and mnemonics and between research findings and clinical practice, this text also points out that, while randomised trials certainly come to end, the acronyms and mnemonics they use may not. In so doing, the text suggests the more subtle and insidious uses that such inventions may subsequently perform.

….. these results support the hypothesis that naming randomized trials with an acronym may enhance the citation rate. This is consistent with the function of acronyms in human language as effective mnemonic tools. Their influence might also be subliminal, since specific acronyms could invoke subconscious value-laden associations that might enhance positive perceptions of the studies they name, a phenomenon in cognitive psychology known as "automatic attitude activation." Enhanced attention to and recall of studies through the use of acronyms may facilitate the appropriate translation of research findings into clinical practice. If acronyms exert influence independently of normative markers of clinical credibility, however, such influence is not rational scientifically, even if it is understandable psychologically. Consequently, this subtle linguistic tool could undermine evidence-based practice. The observed close association between acronym use and sponsorship by the pharmaceutical industry amplifies this concern.

Figure 16
(Stanbrook, Redelmeier 2006, pp. 101-102: subliminal functions of acronyms and mnemonics).

The final category (Column 4 in Table 5) relates to the passage of acronyms and mnemonics from the status of abbreviations used by a specific clinical team in a specific clinical trial to that of a protocol, a much higher status that, once again, has its pros and cons. This is the stage where the socially shared status of *mnemonic checklists* and *mnemonic acronyms* shifts from clinical experimentation to a more universal level of recognition, in part thanks to the prior consensus achieved. Thus, as the SIGHT abbreviation illustrates, medical abbreviations for protocols typically undergo a staged process of approval and assessment: they are first recommended or strongly advised (Figure 17), then made compulsory (Figure 18) and finally proposed as candidate for international protocols (Figure 19).

Key recommendations

1. Clinicians (doctors and nurses) should apply the following mnemonic protocol (SIGHT) when managing suspected potentially infectious diarrhoea:

S	Suspect that a case may be infective where there is no clear alternative cause for diarrhoea
I	Isolate the patient and consult with the infection control team (ICT) while determining the cause of the diarrhoea
G	Gloves and aprons must be used for all contacts with the patient and their environment
H	Hand washing with soap and water should be carried out before and after each contact with the patient and the patient's environment
T	Test the stool for toxin, by sending a specimen immediately

Figure 17
The mnemonic protocol for CDI: NHS England 2013.

SIGHT was coined because of the marked increase in outbreaks of CDI (*Clostridium difficile* infection), attributable to the (mis)use of antibiotics, which led to a European surveillance protocol (*https://ecdc.europa.eu/sites/portal/files/documents/European-surveillance-clostridium-difficile-v2point3-FINAL_PDF3.pdf*). The explicit recognition of abbreviations like SIGHT as a *mnemonic protocol* in the medical literature (Figures 17 and 18) is conditioned by many factors so that the change in status is a gradual process, the result of constant negotiation. As Figure 17 shows, the SIGHT abbreviation is a UK

national protocol; its interpretation by specific NHS Trusts, such as the *Solent NHS Trust* (www.solent.nhs.uk/), through detailed letter-by-letter analysis, has extended its influence. Besides the basic recommendation, Figure 18 reproduces the part of SIGHT relating to the letter G.

(p.6) Clinical staff must apply the following mnemonic protocol (SIGHT) when managing suspected potentially infectious diarrhoea.
(p.7) Gloves and Aprons (Personal Protective Equipment) • On entering the room, staff must wash hands with soap and water and wear an apron and gloves. • Visitors who do not assist in patient care and who have minimal patient contact do not need to wear gloves and an apron. • Visitors assisting with patient care should wear gloves and an apron. • All visitors and staff should wash their hands with soap and water before they leave the room. • Visitors or staff should not eat or drink in the vicinity of the patient. • On leaving the room all staff or visitors (who wear gloves and aprons) must remove and dispose of apron and gloves into the clinical waste bin and wash hands using soap and water
http://www.solent.nhs.uk/_store/documents/ipc11policyforthepreventionandcontrolofclostridiumdifficileinfection.pdf May 2015

Figure 18
Clinical implementation of a mnemonic protocol for CDI: NHS Solent 2015.

On the contrary, the text in Figure 19 (Wiuff *et al*. 2018, p. 15) hints at the difficulties in approving protocol mnemonics beyond national borders, which suggests that the fight against antibiotic resistance first needs to tackle resistance to the use of English as a *lingua franca*.

> When discussing European practice for CDI treatment, variability between countries is inevitable for a number of reasons. Treatment of patients with CD begins with making diagnosis, specifically having a high index of clinical suspicion if a patient has a combination of signs and symptoms and/or CDI risk factors and thereafter conformation by microbiological testing or colonoscopic/histopathological findings. Clinician awareness of CDI as part of the differential diagnostics is therefore crucial for appropriate patient management. However, there remains considerable variability across countries with an estimated 40,000 inpatients potentially undiagnosed annually in European hospitals […]. Mnemonic checklists can be useful tools to reduce clinician error and promote awareness […]. Albeit potentially more useful when English is the commonly spoken language, the SIGHT mnemonic is a useful aide memoire for clinicians when managing patients with suspected potentially infectious diarrhoea …

Figure 19
Negotiating European-wide protocol status: the SIGHT mnemonic for suspected CDI.

Somewhat surprisingly, no mnemonic is used by the Italian CDI protocol which instead provides a summary of actions to be implemented (*Schema riassuntivo azioni da implementare*: http://internetsfn.asl-rme.it/cio/pdf/Protocolli/ 201014 _clostridium_difficile_rev0_14.pdf). Despite the fact that the *g* of Italian *guanti* coincides with the *g* of English *gloves*, the details in the list differ and include face masks as well as gloves and aprons. Leaving to one side issues of whether abbreviations like SIGHT are in best interests of European citizens, the real task facing teachers of medical English is describing

and promoting descriptive frameworks that allow a detailed comparison of the process of summarising and abbreviating within protocols.

This leads us back to the issue of how to instil awareness of different abbreviatory solutions to similar problems in different languages and cultures and the need to explore ways in which corpora can provide the necessary detail on which to pin such comparisons. One candidate for this role is the transformation of *House M.D.* episodes into *clinical vignettes*, a special type of clinical teaching case used primarily to measure trainees' knowledge and clinical reasoning. Essentially a medical vignette describes a hypothetical patient's age, gender, medical complaint and health history (Converse *et al.* 2016, p. 588) using a stepped procedure, as explained in the *I-TECH Clinical Mentoring Toolkit* document entitled *Structured Clinical Vignettes: What Are They and How Are They Used?*:

> Vignettes are structured according to the classic sections of the medical visit—chief complaint; history; physical exam; laboratory and radiographic studies; assessment and plan—presented in chronological order to the trainee. Each section consists of a narrative describing the situation, followed by a question or series of questions prompting the trainee to explain how she or he would care for the patient, given the information presented. The trainee indicates what she or he would do, not by selecting from a fixed list of multiple choice options, but by providing a detailed explanation of steps. This requires trainees to apply their knowledge to the situation, much like […] in an actual patient visit. *www.go2itech.org/HTML/CM08/toolkit/tools/vignettes.html*

Although vignettes are used in exams to encourage analysis of a specific diagnosis or clinical situation or to measure trainees' skills in performing the tasks necessary to diagnose and care for a patient (Nendaz *et al.* 2000; Scalese, Hatala 2013; Holmes, Ponte 2011), the process can be harnessed to test students writing skills, i.e. summarising the reasoning and skills displayed in a TV medical drama in the form of a vignette. Insofar as they present patient-related cases and scenarios involving unusual diseases and unusual presentations of common diseases with an educational value, the episodes in *House M.D.* mimic clinical vignettes and provide a useful framework when encouraging the proposed summarising. Asking students to consider why they think, for example, that CDI is discussed without using the acronym form (*SEASON: 6 - Episode: 05 - Instant Karma - Scene: 04*) in contrast to the use of MRSA (*SEASON: 6 - Episode: 18 - Knight Fall - Scene: 13*) could be the basis of a student's reconstruction of a clinical vignette relating to hospital-acquired infections that summarises these two episodes in a structured way. Although researchers often discuss the issue of abstract writing in ESP and medical training (Dudley-Evans 2002; Griffin, Hindocha 2011) as a desirable vocational skill, undergraduate students in their pre-clerkship years do not have the research experience to achieve this. On the contrary, writing a summary of

a TV episode in keeping with the clinical vignette framework would appear to be a better first step as it provides practice in the art of clinical writing that includes learning how to abbreviate.

To sum up: the research and the support we have received from student annotators has helped promote an understanding of the Pinocchio-like process of conversion of strings of letters into the lifelines that international protocols constitute, but also the snares – some exaggerated, others genuine – on the road to consensus in the use of abbreviations. Acronyms have a life of their own and are not pseudo-words. Whether they present themselves as entities or procedures, they can easily change their forms and functions; they can be borrowed and loaned between languages and genres and can be avoided completely or alternatively invented to give new meanings to existing words, often in a way that is designed to amuse, tantalize and tease. In this sense, they are a continuation in contemporary Medicine of a long line of genres and literary devices that explore amusing ambiguities and paradoxes in word formation – puns, analogies, limericks, metaphors presented as riddles, enigmas and conundrums – many of which can be traced back to the earliest days of English literature (Loiacono 2012) whose origins lie in what has been described as "conscious semantic exploitation" (Pons-Sanz 2014, p. 24).

Perhaps more importantly, the above discussion has established a distinction between: genres that use acronyms and mnemonics in the clinical context (*physical examinations, patient interviews* and *associated questionnaires*); genres that talk about their use in the clinical context (*research articles, handbooks, manuals, dissertations*); genres purely for training and assessment purposes (*primers, clinical vignettes, medical textbooks*). In so doing we have merely scratched the surface as regards a genre-related approach to the learning of abbreviatory processes in medical discourse. Only a brief mention has been made above, for example, of the use of acronyms and mnemonics in handovers (a.k.a. handoffs) and the communication hurdles that have to be overcome, succinctly but safely, when one clinical team (e.g. the 'day' shift) is replaced by another (e.g. the 'night' shift). Nor have we discussed other reflections on acronyms made in medical research genres, such as review articles which, in order to provide state-of-the-art assessments, summarise and weigh up findings about specific topics published in the medical literature and which presuppose a capacity to reconcile different abbreviatory forms and strategies. The fact that at least one review article exists dealing specifically with the 'handoff mnemonics literature' and which reviews '46 articles describing 24 handoff mnemonics' (Riesenberg *et al.* 2009, p. 196; see also Mardis *et al*. 2016) is a clear demonstration of the need to extend what has so far been achieved with the *House Corpus Acronym and Abbreviations* resource.

The need to contemplate different *categories* of medical genres has been underscored many times above. The provision of *Acronyms Maps* suggests one way in which this might be done. Most of the categories mentioned in Table 5 are likely to be represented in the day-to-day work of clinical activities, such as differential diagnosis, whereas those genres used in training and assessment are more likely to include a higher proportion of abbreviations relating to the first two columns in Table 5. In the early stages of medical education, this is probably enough. While a clear boon for medical English classrooms, such maps may also support hunches about differences in the nature and incidence of acronyms in spoken and written forms of medical discourse in English as well as differences with other languages, e.g. Italian, whose oral medical discourse would seem to place less reliance on acronyms than English does. Generally speaking, the more *Acronym Maps* can be retrieved from specialised corpora, such as the *House Corpus*, the better, as this may well encourage greater consideration in corpus studies of specialised genres and contexts. In the case of spoken medical discourse, such studies seem to be particularly urgent (Loiacono 2016).

5. Conclusions

Learning to abbreviate is an essential part of learning how to communicate in any profession, as it requires good judgements to be made. A fine balance has to be achieved in medical communication between clarity of meaning and compact expression. Training medical students, regardless of whether English is their first language or not, to master the use of abbreviatory devices in medical discourse in English, requires clearly-defined descriptive models that illustrate the process of abbreviation at work, ones that, where appropriate, take the different practices of medical discourse in different languages, such as Italian, into account.

Terms like ‘acronym’ and ‘mnemonic’ relate to many different realities that need to be explained to medical trainees in their first years of medical education. Yet, despite medical journals’ heavy investment in online learning, a recent search into online archives such as *The BMJ* and *NEJM* revealed little in support of the learning of abbreviatory processes. The *Acronym Search* resource that the authors have developed for the *House Corpus* is a much-needed first step in this direction. By familiarising students with the realities of acronyms in clinical care in their pre-clerkship years, an awareness has been created of the pitfalls that medical writers have signalled (Baue 2002; Brubaker, Brubaker 1999; Cheng 2003; Kuhn 2007; Patel, Rashid 2009; Pottegård *et al.* 2014; Summers, Kaminski 2004). However, more importantly, a significant step has been made as regards encouraging students to compare

abbreviatory processes in different languages such as English and Italian and to make their *own* judgements about when, and when not, to abbreviate, which includes an awareness of the impracticalities, and in many cases the absurdity, of the demands in the medical literature for acronyms to be abolished or curtailed.

It will be clear from what has been stated above that specialised corpora are needed to satisfy general educational requirements in Medicine. The *House Corpus* shows that the role of specialised corpora can go beyond a mere support for the learning of specific acronyms, promoting instead an awareness of descriptive rather than prescriptive models of the use of abbreviations in clinical care. However, if descriptive approaches are to win the day over prescriptive ones that have muddled thinking and which merely tend to confuse medical students, then a better link-up between medical systems and medical genres is required (Loiacono 2012). In the current project, further work is already underway to fulfil the requirement for the *House Corpus* to incorporate genre-related searches in its interface. A greater focus on the abbreviating process is justified and might be achieved, for example, by encouraging students to 'convert' episodes in the *House MD* series into clinical vignettes.

Addressing the issue of how representative the acronyms included in the *House Corpus* are with regard to those which students meet in their early years of medical training (see *Section 4*) requires further research and assessment. Evaluation of a corpus and its search functionalities is never easy, owing to the co-presence of mutually confounding factors. We are comforted, in this respect, by the insights expressed by others who have used acronyms in their corpus research studies in view of their expectation for "technical acronyms to be relatively stable across languages" (Baroni, Bernardini 2004, p. 1313). We are also reassured by the fact that benchmarking is possible and is indeed a quality-assessment exercise that has a long tradition in corpus studies and in the development of online e-learning resources in Higher Education. In a world of uncertainties, providing medical students with reassurances about the right road to take in their studies of medical discourse is both demanding and at the same time a source of considerable satisfaction. The more research draws on the reassuring footing of corpus linguistics, the more it shines light on the need for further research to be undertaken into the process of abbreviation, whose role in medical communication is all too frequently underestimated and misunderstood.

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