‘Cautious excitement’: The Evaluative Prosody of Cancer Immunotherapy in Online Newspapers and Web Pages of Health Organisations

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Introduction

Examining how a specific cancer treatment is evaluated in different online health information text types can expand our understanding of the challenges that patients and carers may face when making informed decisions regarding that treatment. For cancer patients, one of the main purposes of using the Internet is to find the latest treatment protocols (Dickerson et al.), among which is immunotherapy – the emerging ‘fifth pillar’ of cancer treatment, joining other well-established options:

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surgery, chemotherapy, radiotherapy, and targeted therapy (Oiseth and Aziz 250). Cancer immunotherapy, the study of which is known as immuno-oncology, is a broad term for a group of treatment methods that work by 'activating the immune system for therapeutic benefit in cancer' (Mellman et al. 480). These treatment methods include, for example, producing man-made antibodies to target cancer cells, using drugs to block the proteins that prevent the immune system from identifying cancer cells, or genetically engineering white blood cells to recognise cancer cells (Madden). This study aims to explore how online texts targeting non-specialists evaluate this group of treatments. My use of the term 'evaluation' will henceforth refer to the following definition:

> the expression of the speaker or writer's attitude or stance towards, viewpoint on, or feelings about the entities or propositions that he or she is talking about. That attitude may relate to certainty or obligation or desirability or any of a number of other sets of values. (Thompson and Hunston 5)

With a corpus-based discourse analysis approach (Baker *Using,* Partington et al., Kinloch and Jaworska), this paper focuses on exploring the evaluative meaning patterns of the words, phrases, and structures that frequently accompany the term *immunotherapy/ies*. These patterns are represented by the concept of evaluative prosody (Partington et al.). By unpacking different priorities and values of evaluation, this paper aims to provide insights into the discursive construction of cancer treatments in the public sphere. The texts under investigation belong to two different sources for general readers: online newspapers accessed via an online database and health organisations' web pages retrieved through a search engine, both written in English. My research question is: *How is the evaluative prosody of cancer immunotherapy linguistically constructed in online newspapers and web pages of health organisations?* Throughout the analysis, this paper will also demonstrate how a linguistic framework of evaluation can be used in combination with corpus-based analytical techniques to offer complementary insights.

Online health information and cancer immunotherapy

The present study focuses on two text types providing cancer treatment information and accessible through the Internet. Repeated discourses spreading through mass media can have an 'incremental effect' over time (Baker *Using* 13; Hoey; Stubbs 215). The emotional, cognitive, and behavioural impacts health messages can have on their readers or viewers have been noted in a large body of research (see Kline 558). More specifically, cancer information from traditional media and the Internet has led many patients to actively request specific treatments or even refuse recommendations from healthcare staff (Chen and Siu). Regarding cancer treatments, the Internet has been found to be among the most regularly consulted sources of information on chemotherapy by patients (Muusses et al.).

As noted, immunotherapy as a cancer treatment is the focus of this study. This treatment group has garnered increasing media attention (Worsley) with around 1000 clinical trials conducted worldwide in 2017 (Schmidt) and by August 2021, more than 10 types of immunotherapeutic treatments had been approved around the world (Cancer Research Institute). The development of immunotherapy has witnessed multiple shifts and debates among researchers. In 2003, Parish notes that 'during the last 110 years it is possible to trace at least five dramatic fluctuations in attitude towards cancer immunotherapy' (106). The term 'fluctuations' describes the back-and-forth switch between researchers' 'yes' or 'no' answers to the question 'Is there an immune response to malignant tumours?'. According to Parish, since 1985, the answer has been a definite 'yes', but there are still numerous difficulties that researchers need to overcome.

Evaluation emerges as a notable phenomenon in the discursive construction of immunotherapy for two main reasons. Firstly, mixed evaluation has continued to be shown in recent academic publications. For instance, researchers hailed cancer immunotherapy as 'the future of cancer treatment' (Khalil et al.), 'a paradigm shift' (Anagnostou and Brahmer), and 'a breakthrough' (Couzin-Frankel); however, in the same publications, these authors also outlined doubts, current and future

challenges preventing it from becoming mainstream. Whether such mixed evaluation can be observed in domains outside academia remains to be seen, but Madden has noted how the mass media often presented immunotherapy with 'hype' (5), causing misunderstandings for patients. Secondly, immunotherapy is not only a group of treatments, but it can also be considered a high-profile scientific achievement after two cancer immunologists were awarded the Nobel Prize in medicine in 2018. Although there has been research exploring how scientific advancements are linguistically represented to the public, e.g. studies on achievements in determining the human genetic code (Calsamiglia and Van Dijk) or the recently discovered particle in physics called Higgs boson (Incelli), no similar research has looked into immunotherapy to date. The Higgs boson study has shown how when scientific findings are reported to non-specialist news and blog readers, evaluative expressions of uncertainty or hyperbole are often employed.

Cancer treatments in the news and on health organisations' web pages

Research on news about cancer treatments has been relatively limited compared to research on news articles about cancer in general, and most studies have been conducted in health and medical fields. These studies have explored issues such as the extent to which different treatment-related topics were covered (Fishman et al.), how complementary and alternative medicine was framed (Mercurio and Eliott), or the positive and negative presentation of specific treatment types, for example, a relatively experimental form of treatment called PARP inhibitors (Coleman et al.) and a surgery option for breast cancer known as bilateral mastectomies (Sabel and Cin). Among these studies, those by Coleman et al. and Sabel and Cin essentially explore evaluation in news texts. Coleman et al. examined news articles found through the search engine Google focusing on the discussion of PARP inhibitors. The majority of articles were found to be overly positive due to journalists' and scientists' over-enthusiastic remarks or excessively favourable interpretations of clinical trial results based on small samples. Sabel and Cin, on the other hand, showed that in six major U.S. newspapers, reports of celebrities

choosing bilateral mastectomies had a much more positive tone than those about their decisions to have breast conservation. The authors drew a link between such a bias and many breast cancer patients' mistaken belief that bilateral mastectomies were invariably an optimal choice.

These studies have shown the potential biases carried by both online and print news articles about cancer treatments, but their categorisation of the sub-values of evaluation could not account for nuances. More specifically, Coleman et al. manually characterised each article as 'overly positive/negative' or 'neutral', and Sabel and Cin employed automated tagging using a dictionary of over 4500 words previously coded as either positive or negative (a process known as a sentiment analysis). Although such a binary characterisation provides unambiguous and convenient results, it only foregrounds the evaluation of desirability and ignores other values, e.g. certainty or importance. Studies in the field of linguistics can address this limitation by adopting linguistic theories of evaluation with a robust taxonomy.

Most existing studies on web pages managed by health organisations providing non-specialist information on cancer have also been undertaken in fields related to health and medicine. A vast body of such research focuses on the assessment of informational values by assigning scores to websites based on the presence or absence of the items mandated by a checklist (e.g. Dubois and Folch; Genova et al.; Jørgensen and Gøtzsche; Ream et al.). As such, they rarely engage in in-depth discourse analysis. The few studies on cancer web pages that do analyse language are concerned with how accessible the linguistic representations of cancer information are to readers of different educational and socio-economic backgrounds (e.g. Gibson et al.; Haase et al.) rather than how evaluation is constructed through language.

The present study seeks to contribute to the existing research on cancer treatments on web pages and in the news. Firstly, while the studies on web pages mentioned above have explored multiple stages of a particular cancer from prevention to palliative care, the focus of this paper is narrower, concentrating on a specific type of treatment and how

its evaluation is constructed. Secondly, unlike existing studies on evaluation of cancer treatments in the news that only centred on the positive-negative divide, this study aims to extend the scope of evaluation to include other values and observe when and how each type of evaluation manifests. Thirdly, the examination of two non-specialist text types allows for comparison. As Partington noted, 'it is very often just not possible to evaluate – or sometimes to even observe – the features of one discourse type unless it is seen in perspective, in contrast, with others' (225).

Methodology

Data

A corpus is 'a finite-sized body of machine-readable text, sampled in order to be maximally representative of the language variety under consideration' (McEnery and Wilson 32). Two specialised corpora were built for this study, one for online news sources, which will be referred to as NeC, and the other for web pages, referred to as WeC. This section will describe the database, search tools, and search terms used for data collection, as well as the inclusion criteria and characteristics of each corpus.

The data for NeC was retrieved from the online news archive LexisNexis. The search query can be divided into two parts, one addressing cancer (to eliminate results about immunotherapy as a treatment for other diseases such as allergies) and the other addressing the singular and plural forms of the term immunotherapy using a wildcard character. Regarding the cancer-focused part of the query, a detailed search term developed by Stryker et al. was employed to retrieve cancer news stories through LexisNexis. It includes all conceivable words referring to different human cancer types and stipulates that one of those words must appear at least twice in each text. Regarding the immunotherapy-focused terms, the results of a pilot search indicated that the majority of articles where there was only one instance of *immunotherapy/ies* did not treat the topic as primary, so it was decided that an article had to contain at least two occurrences of the terms for

immunotherapy. Combining the cancer-focused and immunotherapy-focused terms, the complete search query is as follows:

> ATLEAST2 (immunotherap!) AND (ATLEAST2 (cancer! OR leukemia! OR lymphoma! OR melanoma! OR hodgkin! OR tumor! OR sarcoma! OR carcino! OR retinoblastoma! OR adenoma! OR astrocytoma! OR blastoma! OR glioma! OR macroglobulinemia! OR meningioma! OR mesothelioma! OR mycosis! OR myelo! OR neoplas! OR neuroblastoma! OR osteosarcoma! OR pheochromocytoma! OR rhabdomyosarcoma! OR anticancer! OR oncol!)) AND NOT ((feline PRE/1 leukemia) OR (capricorn))[1]

To reduce the number of search results to a manageable size, the articles in NeC had to meet the following inclusion criteria:

(1) Being published in English.

(2) Being published in newspapers that offered both print and digital versions, or had switched from print to digital publications.

(3) Being published within a five-month period from August to December 2018. Using October 2018, the month in which a Nobel Prize was awarded to two immunologists for cancer research, as the median point, the target period was two months on either side of October 2018 inclusive, to capture the significance of this news event without overshadowing other social factors.

WeC contains English-language texts from non-specialist web pages that were retrieved by Google's search engine through two stages. The first stage involved using the Health on the Net (HON) search tool[2] (Boyer et al.). The HON search tool adopted Google's search engine, but it retrieved only the websites that carried its verified logo, which means these websites had been certified as reliable sources according to HON's standards, and then classified them according to two types of target readers – 'patients' and 'professionals'. As this study aimed to explore

[1] In LexisNexis, '!' replaces zero or more characters at the end of a word; PRE/1 means the first word must immediately precede the second word.

[2] https://www.hon.ch/

non-specialist texts, those intended for patients were examined. With the HON search tool, there was no advanced query syntax as in LexisNexis, so two search terms were used to mirror the possible search queries that the average user may employ: 'immunotherapy' and 'immunotherapy AND cancer'.

The HON search tool generated only 10 Google search result pages in total for any query, and many reputable organisations that topped the lists of conventional Google search results had not been recognised by HON, e.g. Cancer Research UK or MD Anderson Cancer Center. As such, a further stage was required to include the web pages from such organisations in WeC alongside those verified by HON. At this second stage, all web pages that met the following criteria were added to WeC:

(1) featuring in the first 10 Google search result pages,

(2) containing verifiable sources of information,

(3) aiming to inform patients or non-specialists.

All the web pages were collected in July 2019.[3]

Both datasets were manually checked to remove duplications and ensure that in every text, cancer immunotherapy is considered the primary topic or among the primary topics. As such, a text was excluded if both following conditions were present: (1) immunotherapy was only mentioned in passing; (2) the primary topics of the text were not treatments but the description of a single patient's illness journey or the promotion of medical centres, products, charitable causes, or researchers' profiles.

Table 1 shows the number of texts in each month in NeC. Table 2 shows the number of words, texts, organisations, and countries included in NeC and WeC.[4] Both corpora are relatively small, but previous corpus-based studies of health communication have testified to the values of

[3] To maximise the replicability of these Google search results, Google's personalisation features had been turned off prior to the searches.

[4] In compliance with LexisNexis's terms and conditions for a personal license and the terms of use on the websites collected (for example https://old-prod.asco.org/about-asco/legal/terms-use#section%209), only examples in the form of short extracts from the datasets are published.

small, specialised corpora (see Hunt and Brookes). Corpus tools have proved useful for even smaller corpora, e.g. nearly 37,000 words of online newspaper texts (Incelli) and around 50,000 words of web-based texts written by health professionals (Kinloch and Jaworska).

Table 1. Distribution of texts in NeC by month

Month	Number of texts
August	24
September	27
October	69
November	27
December	24
Total	171

Table 2. Descriptions of NeC and WeC

Corpus	Number of words	Number of texts	Number of source organisations	Number of countries
NeC	120,215	171	111	18
WeC	101,558	104	59	6

It should be noted that both corpora are imbalanced in terms of the countries represented. In NeC, the U.K. and U.S. account for the highest proportions of all the articles, 27.5% and 22.2% respectively. By contrast, WeC is dominated by texts originating from the U.S. (approximately 87%), from a range of research and education organisations, hospitals,

medical centres, governmental institutions, etc. As NeC contains international news within a five-month span and WeC represents popular online search results at a specific time, it is important to note that representations of immunotherapy may vary across different cultural, geographical, and temporal contexts.

Analytical approach

To explore the patterns of evaluative language around the term *immunotherapy/ies*, this study adopts the concept of 'evaluative prosody' proposed by Partington et al., with its roots in Sinclair's semantic prosody (*Looking;* "The Search"; *Trust*) and Stubbs's discourse prosody. In Partington et al.'s framework, they present three groups of lexical units with evaluative potential:

(1) items whose inherent function is evaluative (e.g. *wonderful*, *terrible*),

(2) items whose evaluative function is not inherent but apparent in interaction with other items (e.g. *cause*, *orchestrate*),

(3) items with no clear evaluative patterns but that in different contexts may begin to carry evaluations through repeated patterns. In an analysis of a short paragraph from a book review, Partington et al. (53) present 'book', 'recent history', and 'British government' as examples of this group because of the attitudinal patterns associated with each of them throughout that text.

Although 'immunotherapy' is a biomedical term, over the past decades, there has been much academic as well as popular interest in its development and impact, with both praise and scepticism (Anagnostou and Brahmer; Couzin-Frankel; Madden; Khalil et al). Thus, it is reasonable to place *immunotherapy/ies* in what Partington et al. call a sub-type of the third category above: 'predominantly denotational' and 'evaluatively neutral' items that are capable of accumulating evaluation 'if repeated or part of a cohesive chain' (53).

Based on such conceptualisations of evaluative potential, evaluative prosody can be defined as 'the interaction of the item with others of

particular polarity as witnessed within a certain text' (ibid. 60). In this study, the concept of evaluative prosody helps us focus our attention on: (1) one central entity, in this case, the name of a treatment group, and (2) its interactions with other items carrying evaluation.

To ascertain whether there are any repeated patterns in how *immunotherapy/ies* interacts with other items across collections of texts, two common techniques from corpus linguistics were employed: collocation and concordance analyses. Collocation refers to the statistically frequent co-occurrence of words (Baker *Using)*, and examining the collocates of a lexical item can provide insights into its evaluative prosody (e.g. Baker *Public Discourses*; Partington et al.; Hua et al.). Concordance lines are displays of a search term, i.e. node, alongside its immediate co-texts on either side; the analysis of these lines offers further insights into contexts and any patterns of co-occurrence.

Quantitative method

The first step was to generate collocate lists in NeC and WeC for *immunotherap** (the asterisk represents zero or more characters to include both the singular, plural, and adjectival forms of the word). There are a variety of collocational measures, and collocate lists can change considerably depending on the chosen statistics (Brezina 70). Thus, it is important to consider more than one algorithm (Baker *Using* 102). In this study, results from both Log-likelihood (LL) and Mutual Information (MI) were examined as LL prioritises collocates with high frequencies and MI prioritises collocates with high exclusivity in the collocational relationship (Brezina 74). For LL, a LL value of 15.13 or higher represents $p < 0.0001$ or 99.99th percentile (Rayson). For MI, any value above zero indicates a collocational relationship (Kolesnikova), with a usual cut-off point of 3.0 (Durrant and Doherty). As MI tends to feature low-frequency items (Brezina), a minimum collocation frequency of 5.0 was required in this study.

Lancsbox 4.5 (Brezina et al.) was used to generate collocate lists.

Lancsbox categorised results based on their positions: left, right, and 'middle' (referring to items with equal left and right raw frequencies). Following Jaworska's approach of examining the top 20 collocates, I examined the top 20 collocates in each position within a span of five words either side of *immunotherap**, although it should be noted that within these datasets, the 'middle' position had fewer than 20 collocates.

Qualitative method

After the collocates were retrieved, two qualitative analyses were conducted. The first analysis aimed to identify any recurrent themes among the lexical collocates, and which of those themes reflects the aspects of immunotherapy that are being evaluated. Grouping collocates together is an approach often adopted in collocation analyses that focus on a specific concept such as studies on 'climate change' (Grundmann and Krishnamurthy; Jaworska) or 'postnatal depression' (Kinloch and Jaworska). The categorisation of the collocates of *immunotherap** in both corpora was conducted manually with a bottom-up approach. This involved carefully examining the extended concordance lines of each lexical collocate to identify similar semantic features and discursive domains among these collocates, and then grouping them into themes that characterise the discursive patterns around the search term in the two datasets. It should be noted that some items were assigned to more than one theme.

The second analysis sought to explore which types of evaluation were constructed in each dataset. Bednarek's framework (*Evaluation*) was chosen for this purpose because it offers a synthesis of a wide range of evaluative sub-values identified in previous studies on stance (e.g. Conrad and Biber), appraisal theory (e.g. Martin and White), and in research by Lemke, Francis, Thompson and Hunston, Chafe, among other scholars. Such diversity is of particular importance, especially because much research on semantic and discourse prosody has demonstrated a 'simplistic view of attitudinal meaning' (Hunston "Semantic Prosody" 256) by examining only the positive-negative polarity. Table 3 summarises Bednarek's framework (*Evaluation*) with definitions and

examples from Bednarek's data for each parameter and its sub-values.

Table 3. A summary of Bednarek's Parameter-based Framework of Evaluation

Parameter	Characteristics	Sub-values/ Sub-types	Examples
Comprehensibility	'the extent to which writers evaluate entities, situations or propositions as being within or beyond the grasp of human understanding', including concepts of 'vagueness', 'explicitness', 'clarity', 'inexplicability', 'mystery', 'unsolved problems' and unknown 'states of affairs' (45)	Comprehensible	*plain, clear*
		Incomprehensible	*mysterious, unclear, vague, complex, ambiguous, uncanny, inconsistencies, questions over, no explanations as to why*
Emotivity	'the writer's evaluation of aspects of events as good or bad, i.e. with the expression of writer approval or disapproval' (45) Note: Analysis of emotive meaning is 'highly subjective' because there are 'no standardised procedures' for identifying them (46).	Positive	*a polished speech, stoutly*
		Negative	*a rant, fanatic, perverse, vicious, attack, stoop to*
Expectedness	'the writer's evaluations of aspects of the world (including propositions) as more or less expected or unexpected', including	Expected	*familiar, inevitably, typical, this is in line with, usually, routine, familiar, little wonder that*

Parameter	Characteristics	Sub-values/ Sub-types	Examples
	concepts of '(counter)expectation', 'usuality', 'familiarity', 'strangeness', 'contrastive/unexpected emphasis', and 'actuality' (48)	Unexpected	*astonishing, surprising(ly), strange, curiously, funnily, strangely, unexpectedly, oddly enough, bizarrely, stunning, unprecedented*
		Contrast	*but, however, although*
		Contrast/ Comparison (negation)	*not, no, hardly, only*
Importance	'speaker's judgement . . . in terms of importance, relevance and significance', including 'notions of stardom/famousness', 'influence/authority', and other related concepts (50)	Important	*key, top, landmark, celebrity, celeb, famous, superstar, empire, leading, senior, top, significant, crucial, crunch, decisive, do-or-die, high-profile, high-rolling, historic*
		Unimportant	*minor, slightly*
Possibility/ Necessity	'the writer's evaluation of what is (not) necessary or (not) possible', excluding 'objective modality' (Lyons) that refers to 'permissions', non-subjective 'obligations', rules, or 'news actor's ability' (50-51)	Necessary	*had to, supposed, required, should*
		Not necessary	*need not*
		Possible	*can, could, allowed*
		Not possible	*inability, could not*

Parameter	Characteristics	Sub-values/ Sub-types	Examples
Reliability	'both the writer's evaluation of the reliability of a proposition and his/her evaluation of the genuineness of an entity or entities' (52)	Genuine	*real*
		Fake	*choreographed, artificial*
		High	*will, be to, certainly, must*
		Medium	*will, likely, probable*
		Low	*may, could, possible*
Evidentiality	"writers' evaluations of the 'evidence' for their knowledge" (53)	Hearsay	*say*
		Mindsay	*think*
		Perception	*seem, appear, look, visibly, audibly, reveal, show, betray, there are signs that, obviously, evidently, apparently*
		General knowledge	*(in)famously, well-known*
		Evidence	*proof that*
		Unspecific	*it emerged that, meaning that*
Mental State		Belief/Disbelief	*accept, doubt, suspect*

Parameter	Characteristics	Sub-values/ Sub-types	Examples
	'the writer's evaluation of other social actors' mental states' (54)	Emotion	*scared, angry, appalled*
		Expectation	*expectations*
		Knowledge	*know, recognise*
		State-of-Mind	*alert, tired, confused, weary*
		Process	*forget, ponder*
		Volition/Non-Volition	*deliberately, forced to, end up*
Style	'the writer's evaluation of the language that is used, for instance, comments on the manner in which the information is presented, or evaluations of the kind of language that is used' (56) *Style:Self*: the writer's discourse *Style:Other*: third parties' discourse	Self	*frankly, briefly*
		Other	*promise, threaten*

For 'close reading' and manual annotation of the data with the evaluative parameters above, a sample of concordance lines from each corpus was used for this analysis. The sampling method is based on a notion elucidated by Hunston and Sinclair (74) – 'a local grammar of evaluation' – which examines grammatical constructions of evaluative patterns in corpus linguistics. Some examples from their work include patterns such as 'It + Link Verb + Adjective Group + Clause' (e.g. 'It was wonderful talking to you' (85)) or 'pseudo cleft' structures (e.g. 'What's interesting is the tone of the statement' (89)). This approach is further illustrated in Hunston *(Corpus Approaches*). However, unlike their focus

on adjectives within clauses that can modify any subjects, the grammatical constructions selected for close examination in this study specifically feature *immunotherap**. The grammatical collocates of *immunotherap** helped identify such constructions. Specifically, one important observation (see Appendices A.1-A.4 for the collocate lists) was that many of the collocates on the right side of the node are verbs in active forms (e.g. 'has/have' + past participle, 'uses', 'used', 'is', 'are', 'may', 'will') because the term or the noun phrases ending with the term are often placed in the subject position of a sentence or clause and, therefore, treated as an actor in a process or a carrier of an attribute.

To retrieve such constructions, two steps were taken. First, all occurrences in which the term is followed immediately by a verb were retrieved. SketchEngine (Kilgarriff et al.) was used for this purpose as Lancsbox 4.5 did not allow for search queries that include both a lemma and a part of speech. Then, from the search results, I selected all the cases in which *immunotherap** or the noun phrase comprising it is strongly topicalised as the subject of the immediate sentence or clause containing it. Co-texts (one sentence preceding or following each search result) were included in the samples where they were considered necessary to complete or clarify the ideas of the retrieved sentences or clauses. The sample for NeC (shortened as NeCS) has a total of 177 instances (i.e. the occurrences of the search query plus the co-texts) or 1840 words, and the sample for WeC (shortened as WeCS) has 450 instances or 3140 words.

To explore the content of NeCS and WeCS, a qualitative thematic analysis (see Brookes and Baker) was conducted. I thematically coded the topics of all the instances. The codes were developed inductively, i.e. driven by the content of these instances. Some instances were assigned more than one code. The results of this thematic analysis helped identify the instances within NeCS and WeCS where evaluation can be best observed. Segments of these instances were then manually annotated with Bednarek's evaluative parameters using the UAM corpus tool 3.3v (O'Donnell), which also calculates the frequencies of those segments. The parameter-based analysis aimed to reveal the most prominent

parameters contributing to the evaluative prosody of the term, and examine their linguistic expressions and discourse functions within the two samples.

Analysis

Collocation in NeC and WeC

As noted in the *Methodology* section, the first analysis involved carefully examining the extended concordance lines of each lexical collocate, and then grouping these collocates into themes based on similar semantic features and discursive domains to identify the topics that evoke evaluation around the search term. As also explained in that section, two measures, LL and MI, were used to generate both high-frequency and high-exclusivity collocates, respectively. The top 20 collocates in each position (left, right, or having equal frequencies on either side) were generated (Appendices A.1-A.4), among which the lexical collocates were examined. As a reminder, the minimum statistical requirements were 15.13 for LL and 3.0 for MI. Some collocates were assigned to more than one theme.

Six emergent themes in NeC are presented in Table 4 with typical co-texts (added in brackets and italicised) to clarify their primary meanings where necessary and collocational statistics (in square brackets).[5] The first theme – *Disease, Treatment, and Science* – covers all the collocates that constitute the discussions of any biomedical aspects of cancer (e.g. 'body's'), specific types and processes of cancer treatment (e.g. 'chemotherapy', 'targeted', 'combination', 'service'), drug names (e.g. 'atezolizumab', 'nivolumab'), research (e.g. 'platform', 'show'), trials, the individuals involved (e.g. 'patient(s)', 'chief' (clinician/executive)), and the locations and names of medical institutes. This is also the theme with the highest number of collocates, as can be seen from Table 4. The theme of *Variety* includes only one collocate that appears in both corpora – 'several', as in 'several types of immunotherapy'. The theme *Quotation* contains a single collocate – 'said', which reflects the common use of direct

[5] If a collocate is on both lists, its co-text is presented on the LL list only.

and indirect quotes to present opinions from experts and patients.

Table 4. Top collocates in NeC categorised into six themes

Theme	LL	MI
Disease, Treatment, and Science	**cancer** [828.39], **treatment** [360.77], **drugs** [274.14], drug [228.59] **chemotherapy** [214.92], **patients** [164.83], **combination** [155.43], **field** [131.06], **uses** [126.82], **body's** *(the body's immune system)* [117.15], **trial** [110.48], used [106.30], **targeted** [85.04], **use** [80.44], **approach** [46.00], **trials** [43.37], **medicine** [25.63], **year** (*one year of immunotherapy treatment*) [16.62] *Places:* **royal** [31.63]	**platform** (*the Immunotherapy Platform at the… Cancer Center; platform for research)* [6.85], **involves** *(a trial that involves… drug; cancer treatment routinely involves…)* [6.00], **service** [5.88], **field** [5.83], **combination** [5.78], **combining** [5.76], **targeted** [5.54], **therapeutic** [5.49], **effectiveness** *(to increase/improve/enhance the effectiveness of…)* [5.49], **medication** [5.37], **body's** [5.23], **option** [5.21], **chief** [5.13], **offered** [5.12], **combined** [5.07], **along** (*chemotherapy along with immunotherapy*) [5.06], **drugs** [5.00], **using** [4.98], **atezolizumab** [4.94], **nivolumab** [4.90], **chemo** [4.90], **show** (*findings show that…*) [4.88], **tested** [4.88], **use** [4.87], **approach** [4.58], **trials** [3.88], **medicine** [3.08], **patient** [3.04] *Places:* **germany** [5.88], **marsden** [5.77], **royal** [5.04], **memorial** [5.31], **sloan** [4.88]
Variety	**several** [22.53]	**several** [3.99]
Time	**new** [230.41], **now** [90.55], **first** [90.42], **development** [83.26], **already** [44.14]	**pioneering** [6.45], **currently** [5.33], **development** [5.21], **advances** [5.09], **recently** [4.98], **already** [4.45]
Potential	**more** (*will help make immunotherapy more effective in more patients*) [133.81]	**promise** [6.11], **promising** [5.68], **shown** (*has/have shown promise/promising results*) [4.88]
Success	**more** (*are more effective; is much more targeted*) [133.81]	**extends** (*extends the life of…*) [7.26], **extend** [5.49], **breakthrough** [5.09],

		shown (*have shown an increase in survival*) [4.88]
Quotation	**said** [181.19]	

The rest of this section will concentrate on the three themes where the concordance lines of the collocates reveal which aspects of the treatment evoke evaluation: *Time, Potential*, and *Success*. The first one is *Time*, which includes collocates depicting temporal order, change, and progress. With 'already', we start to see explicit evaluation (all examples henceforth are judged to be representative of the patterns being examined), e.g.:

1. Some prominent sceptics of immunotherapy had **already** started coming around. (*The Times* 24.11.18)
2. Immunotherapies are **already** revolutionizing treatment for several cancer types. . . . (*Iran Daily* 01.12.18).

Alongside such acknowledgement of progress, the quality of being 'new', which is the collocate with the highest ranking by LL in this theme, is also emphasised. 50/55 co-occurrences of 'new' associate immunotherapy with favourable developments or characterise it as a viable option different from but compatible with other treatments, e.g.:

3. A **new** immunotherapy can greatly extend the lives of some people with advanced head and neck cancer. . . . (*The Herald* 01.12.18)
4. . . . develop a **new** type of immunotherapy for prostate cancer by targeting a feature of cancer cells that has never before been tested. (*The Herald* 05.11.18)
5. One of the **new** immunotherapy drugs has shown promise against breast cancer in a large study that combined it with chemotherapy. (*Times Colonist* 24.10.18)

Not only the treatment but the people involved in its research are also characterised as innovative, as can be seen from the collocate 'pioneering' (6/8 co-occurrences), which tops the ranking by MI in this theme, e.g.:

6. Pierce, whose **pioneering** work in cancer immunotherapy helped expand pembrolizumab's use in the clinic,. . . . (*The Philadelphia Inquirer* 09.08.18)

The two themes that show the most explicit expressions of evaluation are *Potential* and *Success*. The former consists of items related to the positive evaluation of its current states or prospects and the latter contains items related to its past successful clinical results. The collocate 'more' appears in both themes and constitutes different evaluative topics. As can be seen from the co-texts in Table 4, in *Success*, the adverb 'more' highlights the advantages of immunotherapy over other groups of treatment (2/36 co-occurrences), whereas in *Potential*, as both an adverb and a determiner, 'more' characterises the advances expected to be made in the future (17/36 co-occurrences), which can be further observed in the following examples:

7. "What we learn from this study will help make immunotherapy **more** effective in more patients. . . . (*The Journal Record* 04.12.18)
8. In a bid to make immunotherapy, the newest cancer treatment, **more** accessible, doctors and scientists from across the country will hold a meeting. . . . (*Hindustan Times* 31.12.18)

In both *Potential* and *Success*, all co-occurrences of 'promise', 'promising', and 'breakthrough' indicate past and expected achievements, e.g.:

9. These cell-based immunotherapies continue to show great **promise** and are improving survival for many patients, including children, living with cancer. (*The Alestle* 06.12.18)
10. ". . . are thrilled to be so close to the launch of our clinical trials of two **promising** new immunotherapies." (*Victoria News* 07.12.18)
11. . . . a **breakthrough** immunotherapy drug called pembrolizumab, which has been found to stop some prostate tumours growing and even eradicate cancer altogether. (*Illawarra Mercur*y 27.09.18)

Overall, the collocates constituting the three themes *Time*, *Potential*, and *Success* in NeC have shown that the primary topics evoking evaluation in NeC are recent medical developments, future possibilities, and past clinical results.

With the same analytical procedure used for NeC, six themes emerged from the collocates in WeC (Table 5). The first five themes in both Table 4 for NeC and Table 5 for WeC are similar, suggesting that both corpora have similar discussion topics: (i) concepts and people involved biomedical and scientific processes, (ii) range of treatments and effects, (iii) recent developments, (iv) hopeful expectations, and (v) existing successful results. Another similarity is that, in both corpora, evaluation can be clearly identified in the three topics (iii), (iv), and (v) above, i.e. *Time, Potential,* and *Success,* although the collocates constituting these themes may vary across corpora. Examples 12-15 illustrate the use of such collocates in WeC:

12. Immunotherapy is a **promising new** strategy to treat cancer. (*Cancer.Net*)
13. They give patients early access to **cutting-edge** treatments, like immunotherapy, which can lead to research progress, improved treatment and better results. (*PanCAN*)
14. Many cancer specialists are optimistic ongoing research in clinical trials will make immunotherapy even safer and **more effective** than it is today. (*Asbesto.com*)
15. The future of cancer immunotherapy is an **exciting** one. (*Roche*)

Table 5. Top collocates in WeC categorised into six themes

Theme	LL	MI
Disease, Treatment, and Science	cancer [2027.43], immunotherapy [1337.56], types [879.13], effects [691.91], treatment [657.36], side [653.50], treatments [461.75], work	video (*this video shows…*) [6.30], non-specific [6.25], passive [6.07], biologic [5.97], harnessing [5.75], visit (*a website*) [5.71],

	(*work by boosting your immune system*) [409.26], **type** [380.26], **non-specific** [303.81], **checkpoint** [206.78], **drugs** [358.87], **clinical** [357.33], **immune** [307.48], **doctors** [85.63], **certain** (*types/ immunotherapies*) [76.47], **well** (*how well immunotherapy works*) [70.93], **field** [49.71], **reactions** [41.17], **science** [37.90], **forms** [37.80], **approach** [36.33], **oncolytic** [23.67]	**refers** (*immunotherapy refers to...*) [5.71], **adjuvant** [5.71], **harnesses** [5.56], **active** [5.45], **experimental** [5.39], **program** [5.36], **fda-approved** [5.32], **management** (*of side effects*) [5.27], **medicines** [5.24], **widely** (*make it more widely used*) [5.21], **history** (*treatment history, history of immunotherapy*) [5.13], **question** (*question checklist*) [5.13], **combining** [5.06], **long-term** [5.04], **discuss** (*with your doctors*) [4.97], **having** (*immunotherapy as a treatment*) [4.97], **join** (*a clinical trial*) [4.97], **immunology** [4.97], **types** [4.93], **form** [4.92], **comes** (*comes in pills or capsules*) [4.87], **field** [4.65], **science** [4.51], **reactions** [4.13], **doctors** [3.97], **forms** [3.90], **approach** [3.80], **well** [3.74], **certain** (*types/ immunotherapies*) [3.69], **oncolytic** [3.33]
Variety	**different** (*types/ways, different from other cancer treatments*) [428.98], **several** [231.15], **ways** (*work in different ways, side effects affect in different ways*) [107.04], **wide** (*range/variety*) [34.72]	**wide** [5.10], **different** [4.97], **several** [4.94], **ways** [4.12]
Time	**new** [310.27]	**cutting-edge** [6.30]
Potential	**more** (*will make... more effective*) [259.61], **effective** [66.30]	**suitable** [5.56], **exciting** [5.43], **promising** [5.14], **benefits** [4.94], **effective** [4.14]

Success	**work** (*may work when other treatments don't*) [409.26], **more** (*more effective; more likely to work*) [259.61], **effective** [66.30]	**advantages** [6.20], **benefits** [4.94], **effective** [4.14]
Problem	**work** (*does not work for every cancer type*) [409.26], **severe** [34.30]	**challenges** [5.30], **everyone** (*not working for everyone*) [4.92], **severe** [3.26]

Unlike in NeC, the sixth theme in WeC is *Problem*, which reveals two aspects of immunotherapy that are cause for concern. First, all 12 co-occurrences of the collocate 'severe' point to the topic of side effects, e.g.:

16. Immunotherapies may also cause **severe** or even fatal allergic reactions. (*U.S. National Cancer Institute*)

It should also be noted that both 'side' and 'effects' are among the top collocates in the theme of *Disease, Treatment, and Science* in WeC but not in NeC.

Second, limited effectiveness is another notable theme evoking evaluation, as evidenced by 15/91 cases of 'work' and 11/13 cases of 'everyone', e.g.:

17. The most challenging issue is that checkpoint immunotherapy doesn't **work** for **everyone**. . . . (*Cancer Council Victoria*)
18. Not **everyone** benefits from immunotherapy. We are just scratching the surface of understanding what factors can be used to identify the patients who may benefit. . . . (*Cancer.Net*)

Overall, alongside the three themes *Time*, *Potential*, *Success* in WeC which foreground similar evaluation-oriented topics as seen in NeC, WeC also has the theme *Problem*, which focuses on the medical drawbacks related to side effects and effectiveness.

By looking at the similar semantic and discursive features of the top collocates, the first analysis has identified (i) the broad areas of meaning, i.e. themes, of the lexical items often found in the company of the central term, and (ii) which topics are most likely to contribute to its evaluative prosody. The repeated interactions between the term and certain thematic groups of lexical items have been shown to carry relatively

explicit evaluation. Specifically, in both NeC and WeC, evaluation is evoked around the topics of recent advancement (*Time*), favourable results in the past (*Success*), and hopeful expectations for the future (*Potential*). Notably, in WeC, one theme also points to concerns and difficulties (*Problem*). The next section will examine two samples of NeC and WeC, exploring their content and then describing in detail how different evaluative sub-values are used and combined.

An overview of the evaluative parameters

As described in the *Methodology* section, to explore which specific types of evaluation were evoked, the second analysis involved three stages: (i) creating two samples, NeCS and WeCS, of the main corpora, (ii) characterising the content of these samples, (iii) annotating and analysing the parameters of evaluation identified within these samples. As also noted in that section, stage (ii) was a qualitative thematic analysis, in which all the instances (i.e. the occurrences of the search query plus the co-texts) were coded inductively. Six categories emerged from this analysis, and the number of instances for each are presented in Table 6 below. Some instances were assigned to more than one category.

Table 6. The number of instances for each category in each sample

	NeCS		WeCS	
General comments	91	51.4%	116	25.8%
Definition	13	7.3%	81	18%
Effectiveness	54	30.5%	53	11.8%
Side effects	12	6.8%	48	10.7%
Cost	8	4.5%	3	0.7%
Others (biomedical and clinical facts)	22	12.4%	152	33.8%

General comments, which include sentences such as 'immunotherapy is exciting, yet we have much to learn' or 'immunotherapy may replace chemotherapy in 10 years', cover a wide range of topics rather than focusing on a single topic compared to the other groups. It is also the

largest group in both samples apart from *Others*. Preliminary analysis of the instances in *General comments* also revealed that this group has the most complex use of evaluative parameters, and thus it was the focus of the annotation stage.

The annotation stage considered all six core parameters (*Comprehensibility, Emotivity, Expectedness, Importance, Possibility/Necessity, Reliability*) and one peripheral parameter, *Evidentiality*. The other two peripheral parameters, *Mental state* and *Style*, were excluded as they are concerned with the evaluation of social actors' mental states and language use (Bednarek *Evaluation*), which are of little relevance to the concept of immunotherapy itself within these corpora. The sub-values of these seven parameters were assigned to segments of each instance within the *General comments* group. Table 7 shows the number of segments annotated with the sub-values of each parameter and their percentages (see Table 3 for the definitions of these sub-values).

Table 7. The number of segments annotated with evaluative sub-values found in 'General comments' in each sample

	NeCS – GC		WeCS – GC	
	N	Percent	N	Percent
Total units	225	100	217	100
Parameters				
Comprehensibility	3	1.33	4	1.84
Emotivity	63	28	58	26.73
Expectedness	63	28	64	29.49
Importance	45	20	42	19.35
Possibility/Necessity	0	0	2	0.92
Reliability	27	12	40	18.43
Evidentiality	24	10.67	7	3.23
Comprehensibility				
Comprehensible	0	0	0	0
Incomprehensible	3	1.33	4	1.84
Emotivity				
Positive	54	24	50	23.04

Negative	9	4	8	3.69
Expectedness				
Expected	30	13.33	29	13.36
Unexpected	5	2.22	2	0.92
Contrast	13	5.78	7	3.23
Contrast/Comparison	15	6.67	26	11.98
Importance				
Important	42	18.67	42	19.35
Unimportant	3	1.33	0	0
Necessity/Possibility				
Necessary	0	0	1	0.46
Not necessary	0	0	1	0.46
Reliability				
Genuine	2	0.89	1	0.46
Fake	0	0	0	0
High	10	4.44	4	1.84
Medium	4	1.78	13	5.99
Low	11	4.89	22	10.14
Evidentiality				
Hearsay	21	9.33	5	2.3
Mindsay	0	0	0	0
Perception	0	0	0	0
General knowledge	0	0	0	0
Evidence	2	0.89	1	0.46
Unspecific	1	0.44	1	0.46

The parameter-based analysis in the next section will explore in detail five out of the seven selected parameters. They include *Emotivity*, *Expectedness*, *Importance*, and *Reliability,* which are the four most prominent parameters in both samples, and *Comprehensibility*, which has relatively limited occurrences compared to the top four parameters, but accounts for similar proportions in both samples, as can be seen from Table 7. The two parameters excluded from the in-depth analysis are *Evidentiality,* which accounts for 10.67% in NeC but only 3.23% in WeC, and *Necessity/Possibility*, whose figures are virtually negligible compared to the others. Regarding *Evidentiality*, the previous analysis of

the top collocates has identified *Quotation* as a notable theme in NeC compared to WeC. Thus, it is not surprising that *Evidentiality:Hearsay,* mostly through direct quotations, is also more prominent in NeCS. It should be noted that the views expressed come not only from the writer(s) of the articles but also from the individuals they quote. For the current purpose of exploring the evaluative prosody of the term *immunotherapy/ies*, analysis of such attributions is considered not necessary, although this may be of interest in future research. Regarding *Necessity/Possibility,* there are very few references to writers' evaluation of what should be done (2 occurrences for *Necessity* found only in WeCS) and no mention of writers' evaluation of what is possible in the past or present (*Possibility*), while, according to Benarek's (*Evaluation*) framework, future predictions evoke evaluations of *Reliability* rather than *Possibility*. Bednarek (ibid.) also noted that her newspaper corpus contained very few references to *Necessity/Possibility*, and hypothesised that this feature was 'restricted to other genres such as commentaries' (110).

The functions and usage patterns of *Emotivity*, *Expectedness*, *Importance*, *Reliability,* and *Comprehensibility* in *General comments* will be delineated in the following sections. Further comments on the topics other than *General comments* will also be made. The total number of occurrences of a feature or pattern or the number of instances in which it appears will be shown in brackets where relevant.

General comments in NeCS

The four parameters *Emotivity*, *Expectedness*, *Importance*, and *Reliability* are employed and combined in various ways to construct two main dominant and consistent themes: *Development over time* and *Potential versus Caution*.

Regarding development, the focus is on the status of immunotherapy as being new and different, which is formulated mainly through two parameters: *Emotivity* and *Expectedness*. As can be seen in the collocation analysis, 'new' is one of the top collocates of *immunotherap**. Bednarek ("Astonishing" 204) points out that although 'new' may appear neutral,

when it is associated with a desirable goal, for example in advertising discourse, it can carry positive evaluation. Similarly, in this context, 'new' does not merely refer to the late emergence of immunotherapy compared to other treatments, but is also associated with a forward step in scientific development, and a welcomed addition to existing treatment options. Thus, 'new' can be said to evince *Emotivity:Positive*.

Throughout the sample, this status of being new is realised directly through the adjective 'new' (14 occurrences), and indirectly through other expressions (seven occurrences) such as 'in a recent clinical trial', 'among the most current treatments', 'is an up-and-coming field'. However, there are two instances in which this theme is partially resisted:

19. The idea behind cancer immunotherapy is **not** new. **Yet** it's taken more than a century to prove its worth. (*Irish Daily Mail* 04.09.18)
20. Immunotherapy has been known to us for several years **but** the biggest development happened only recently. (*Khaleej Times* 06.10.18)

These two instances, while emphasising the contemporary significance of immunotherapy, also acknowledge the length of time between its inception and its current status, which offers a more realistic and better-informed account of scientific research.

Devices within the parameter of *Expectedness* (e.g. 'yet' and 'but' for *Expectedness:Contrast* in Examples 19-20) are not only seen in those two cases that discuss the 'new' status, but also commonly used in the construction of immunotherapy as being different or unique, in terms of both theoretical approaches and clinical results. Some examples include 'unlike' (three occurrences) and 'in comparison' (one occurrence), and even one extreme case formulation (Arribas-Ayllon et al. 68): 'immunotherapy is **like no** cancer treatment we've **ever seen**' (*The Daily Oklahoman* 02.09.18), all of which are part of *Expectedness:Contrast/Comparison*, with the final example carrying an undertone of *Expectedness:Unexpected*.

Alongside the 'new and different' status, another common thread in

the *Development* theme is rising *Importance* (38 occurrences). This is best illustrated in two occurrences where immunotherapy is said to have transformed from a 'last resort' into 'first-line treatment' or 'first choice'. These phrases highlight two opposite sub-values of *Importance*, mapping the progress immunotherapy has made from being *Unimportant* in the past – as a last resort – to becoming as *Important* as a first-line treatment for some cancers in the present, with growing advocacy for it to become a 'standard treatment' for other cancers in the future. In a similar vein, the question of whether it can eventually replace other treatments also arises from the sample. The evaluation of this future possibility, however, seems to be mixed as both the *Low* and *High* levels of *Reliability* are employed:

21. Immunotherapy **may** replace chemotherapy in 10 years. (*The Times of India* 11.11.18)
22. The immunotherapy **will not** replace the other cancer treatments, but within five years it **will** be part of the therapy for **almost** all patients. . . . (*CE Noticias Financieras English* 02.10.18)

Example 21 appears in a headline with no attribution and no clear supporting evidence in the body text, and Example 22 is attributed to one Nobel-prize-winning scientist. Such a difference in authorship can influence the degree of *Reliability* from readers' perspective. This exemplifies how 'expert authority' – one of the legitimation strategies described by van Leeuwen (94-95) – comes into play.

In the second theme – *Potential versus Caution* – potential is primarily constructed by a blend of *Emotivity:Positive, Expectedness:Expected* and *Importance:Important* with varying degrees of *Reliability*, and caution is mainly signalled by *Expectedness:Contrast or Emotivity:Negative*. The most common lexical items that construct the discourse of *Potential* are 'breakthrough' (four occurrences) and 'promise/promising' (five occurrences), both of which are collocates of *immunotherap** measured by MI. While 'promise/promising' is regarded as *Emotivity:Positive*, 'breakthrough' seems to incorporate both *Emotivity:Positive* and *Importance:Important*, as it refers to medical advances (*Importance:Important*) in treatment that tend to be associated with

desirable implications such as extending or saving lives (*Emotivity:Positive).*

Another important concept within *Potential* is hope (28 occurrences), which is a combination of *Emotivity:Positive* and *Expectedness:Expected.* Hope is represented either explicitly or implicitly. Explicit constructions include the word 'hope(ful)' (10 occurrences), e.g.:

23. While the immunotherapy is offering new **hope** to patients who are out of treatment options. . . . (*The Philadelphia Inquirer* 28.08.18)

Hope can also be constructed implicitly without the use of 'hope(ful)' (18 occurrences), e.g.:

24. Immunotherapy has **opened the doors** for all cancer patients. . . . (*Khaleej Times* 06.10.18)

Among those implicit constructions, there is one instance in which hope is expressed through a prediction for cures that go beyond cancer:

25. In the future, immunotherapy could develop into a **cure for many more illnesses than cancer**. (*The McGill Tribune* 06.11.18)

Another strategy for implicitly constructing hope is through the expression of *Reliability:High* (seven occurrences) and *Reliability:Low* (seven occurrences), illustrated by Examples 26 and 27 respectively:

26.. . . immunotherapy is offered, **guaranteeing** the patient greater adherence, efficacy, reduction of secondary risks of toxicity and greater benefit. . . . (*CE Noticias Financieras English* 13.11.18)

27.. . . it has sent a new jolt of energy into an age-old dream: that **maybe**, **just maybe**, medical science can turn terminal cancers into survivable conditions. (*The Times* 24.11.18)

The theme of *Caution* (eight occurrences), on the other hand, is often realised through *Expectedness:Contrast* (seven occurrences), e.g.:

28.And immunotherapy represents, perhaps, cancer treatment's most exciting breakthrough in decades. **But** it's no magic bullet. (*The Daily Oklahoman* 02.09.18)

29.. . . **although** immunotherapy is brilliant in theory, in practice the results thus far have been mixed. (*Eureka Times* 04.12.18)

Expressions of *Emotivity:Negative* (nine occurrences) also indicate potential problems that signal *Caution*, e.g.:

30.. . . one of the biggest **challenges** of immunotherapies is predicting how well they will work with the patient's immune system, and understanding what the side effects could be. (*The Independent* 19.11.18)

31.. . . he felt "**cautious** excitement" that immunotherapy may prove helpful for certain breast cancer patients. (*The Washington Post* 21.10.18)

Other topics in NeCS

The *Definition* group contains 14 instances that all personify 'immunotherapy', 12 of which are warfare metaphors, e.g.:

32.makes it easier for the body's natural defenses to fight cancer *(The Straits Times* 05.11.18)

33.adds arsenal to the immune system (*The New Zealand Herald* 15.09.18)

Although these metaphors do not explicitly convey writers' opinions, it can be argued that they embody the power of science and medicine, positioning scientific advances as gaining ground on a relentless and powerful arch-enemy – cancer – and, thus, expressing both *Emotivity:Positive* and *Importance:Important.*

As far as *Effectiveness* is concerned, there are two main topics: success and limitations. Reports of success (30 instances) are quite consistently tied to a particular type or group of cancers or patients rather than all cases (e.g. 'Immunotherapy works best in cancers that have **lots of mutations.**' (*The Daily Telegraph* 04.09.18)).

Limitation reports (12 instances) are presented using any of the three

following primary strategies. First, contrasting devices – *Expectedness:Contrast* – are used to follow up a limitation with a more hopeful finding (four instances), e.g.:

34.Immunotherapies tend to work for only a minority of patients. . . . **However**, these patients' tumours did not grow for an average of 21 months compared with five months for those on chemotherapy. (*The Times* 23.10.18)

Second, in at least one case, the pairing of positive/negative contrast is not directly signalled by a conjunction between two adjacent sentences/clauses but spreads over a paragraph and constructed by various sub-values ('only' for *Expectedness:Contrast/Comparison*, 'hope' for *Emotivity:Positive*):

35.The drug . . ., pembrolizumab, helps **only** one in ten men with prostate cancer [two sentences omitted]. Professor Swanton, . . . is pinning his hopes on developing a specific type of checkpoint inhibitor drug **in the hope that** it will be a 'one-size-fits-all' cure. (*Irish Daily Mail* 04.09.18)

There are four cases where the pairing spreads over the whole text, in which cases the discussion on the disadvantages of the treatment was placed in the final section of the article.

Third, limitations can be highlighted with *Comprehensibility:Incomprehensible* (3 instances), e.g.:

36.. . . experts **still don't know** how to use it in the best form". (*Hindustan Times* 31.12.18)

Regarding the topic of *Cost,* it is unanimously portrayed as a caveat (*Emotivity:Negative*) with all instances pointing to low affordability ('high', 'exorbitant', 'major deterrent', 'jaw-dropping', 'controversial').

In the topic of *Side effects*, however, the overall picture is much less consistent with a mixture of *Emotivity:Positive* and *Negative*. Three out of twelve instances mention severe side effects, whereas one personal story reports none, and the other cases praise immunotherapy for having fewer side effects compared to other treatments.

In summary, the evaluation patterns found from the above parameter-based analysis of NeCS are in alignment with the primarily positive and hopeful tone reflected in the collocation analysis of NeC. Going beyond that surface, this analysis has also revealed nuances that would be very difficult to observe from the top collocates in NeC alone. Specifically, we could see variable levels of certainty (*Reliability:Low/High*), and contrastive expressions (*Expectedness:Contrast*) are drawn upon to maintain hope when less welcoming news is involved. The analysis has also shown that the *Importance:Important* is consistently constructed in NeCS, while both opposing sub-values of *Emotivity* co-exist in the dataset.

General comments in WeCS

The four prominent parameters *Emotivity*, *Expectedness*, *Importance*, and *Reliability* also construct two broad themes in WeCS: *Development over time* and *Potential versus Caution.* However, there are noticeable differences in the employment of these parameters in the two sample corpora.

As also observed in NeCS, in WeCS the status of being new and unique is central to the *Development* of immunotherapy over time, with the use of *Emotivity:Positive* (e.g. 'new') and *Expectedness:Contrast/Comparison* (e.g. 'unlike chemotherapy and radiotherapy'). However, in some instances, 'new' (13 occurrences) does not appear alone but is part of an adjective phrase, being qualified by adverbials denoting comparison: '**comparatively** new', '**relatively** new', and 'a much newer treatment **compared to chemotherapy**'. Such adverbial hedges are considered part of *Reliability* (Bednarek *Evaluation* 21) as they reduce the scope of the statements. Another notable difference in WeCS is the cases in which 'new' is directly associated with difficulty in grasping its full impacts through *Comprehensibility:Incomprehensible* (three occurrences), e.g. 'Because immunotherapy is so new . . . **predicting** the side effects for an individual patient is **not easy**.' (*Cancer.Net*). Thus, it seems WeCS is more careful with the description of 'new' than NeCS is.

Similar to two cases found in NeCS, there are four cases in WeCS in which the status of 'new' is resisted to emphasise the long history of the treatment: 'its origins go back **more than a century**'; 'immunotherapy is **not** a new idea'; '**isn't** a new science', 'the concept . . . has actually been around for **a long time**'. The 'unique' theme is also contradicted in one case where the focus is not on biological mechanisms and results but delivery methods, thus leading to a seemingly contradictory observation: 'Immunotherapy is **a lot like** *(Expectedness:Expected)* other forms of cancer treatment.' (*WebMD*)

Another sub-theme within diachronic *Development* that is present in both NeCS and WeCS is the growth in *Importance.* In both corpora, *Importance* is constructed as the increasing significance of immunotherapy in terms of its impact on the study and practice of cancer treatment. In WeCS, *Importance* is also discussed in terms of media publicity (six occurrences):

37. Immunotherapy . . . is generating **a lot** of **international headlines**. (*Canadian Cancer Society)*

These points likely serve the purpose of managing expectations, in which the popularity of immunotherapy is acknowledged in an attempt to affiliate with readers' media-led preconceptions of the treatments before presenting information that may either support or contradict such preconceptions.

The second major strand – *Potential and Caution* – is as complex in WeCS as in NeCS. Regarding *Potential*, apart from mentions of 'breakthrough' (*Importance:Important* and *Emotivity:Positive*) as already seen in NeCS, 'miracle' has also come up twice in WeCS. However, its positive quality is often intertwined with caution and is considerably diminished by *Expectedness:Contrast* or *Reliability:Medium/Low,* as in Examples 38 and 39 respectively:

38. **While** immunotherapy is nothing short of a miracle. . . , it **doesn't work for everyone**. (*healthline*)

39. There have been media reports of how immunotherapy is a "miracle drug" and how it can cure cancer. . . . Because of these

factors, people's **expectations can be high** when starting treatment.' (*Cancer Council Victoria*)

The most common *Emotivity:Positive* adjectives to highlight potentiality are 'exciting' (eight occurrences) and 'promising' (six occurrences), which are also the collocates generated with MI.

Similar to NeCS, the discourse of hope is also salient in WeCS, and manifests in numerous ways, either directly through two mentions of 'hope', or indirectly (17 occurrences), such as through the use of 'potential(ly)' (six occurrences), e.g.:

40. Immunotherapy has the **potential** to be effective for virtually all forms of cancer. (*PICI*)

Indirect expressions of hope can also include a combination of *Expectedness:Contrast, Expectedness:Expected* and *Importance:Important* (two occurrences), e.g.:

41. It is not yet a part of **standard, first-line treatment** for the cancer, **but** medical research is getting **closer to making it a reality**. (*Asbestos.com*)

Another strategy for implicit construction is the employment of *Reliability:Low* (nine occurrences):

42. Immunotherapy **may** work when other treatments don't. (*WebMD*)

As for the theme of *Caution*, three types of construction have been found. The first type indicates *Comprehensibility:Incomprehensible* (four occurrences), e.g.:

43. And if it does work, some people are always **wondering** how long immunotherapy will control the cancer or whether the cancer will come back. (*Cancer Council Victoria*)

The second type emphasises *Expectedness:Contrast* (five occurrences), e.g.:

44. The field of immunotherapy is exciting, **yet** we have much to learn. (*Verywell Health*)

The third type evokes *Emotivity:Negative* (eight occurrences):

45.Immunotherapy can be **stressful**. . . . (*HCAHealthcare UK)*

Within *Caution*, a sub-theme, *Suitability,* has been found, which seems to be exclusive to WeCS. The adjective 'suitable' is one of the collocates generated with MI in WeC and does not feature in the top collocates in NeC. Close examination of WeCS reveals that it appears in a consistent pattern (five occurrences): ***'whether/if immunotherapy is (a) suitable (treatment) for you'***. This is also true for all of the 12 occurrences of 'suitable' in the whole WeC. Two examples in WeCS are:

46.Ask your doctor if immunotherapy is a **suitable** treatment for you. (*Cancer Council NSW*)

47. If you . . . would like to know more about whether immunotherapy is **suitable** for you, talk to your medical team. (*The Brain Tumour Charity*)

In these examples, by using the structure 'whether/if' and refocusing the readers' attention on medical professionals ('your doctor/consultant/medical team'), the writers have detached themselves from the evaluation of the treatment and orient towards giving counsel to the readers by using imperatives.

Other topics in WeCS

Some observations of the *Definition, Cost,* and *Effectiveness* groups in WeCS are similar to what has been noted in NeCS:

(i) The dominant use of war-related metaphor and the stress on high costs

(ii) The use of *Expectedness:Contrast* devices to pair a less expected/ pleasant statement with a more positive prospect in *Effectiveness* (four instances out of 14 mentions of limitations), e.g.:

48.Immunotherapy doesn't work for all types of cancer. **But** doctors and researchers are still hard at work to create . . . and figure out. . . . (*WebMD*)

(iii) The feature of *Comprehensibility:Incomprehensible* in discussions on the current lack of certainty (six instances in *Effectiveness*), e.g.:

49.Doctors **aren't sure yet** why immunotherapy helps only some people. (*WebMD*)

Unlike in NeCS, however, half of the comments on successful results (14 out of 28) do not mention specific types of cancer or patients and only provide a general overview such as 'works **better** for **some** types of cancer than for others'.

Side effects is a much larger group in WeCS compared to NeCS, with five primary features (Table 8).

Table 8. Evaluation of side effects in WeCS

1. The most consistent message affirmed throughout almost all instances is that immunotherapy does have side effects and those depend on various factors. Note: The possibility of having no side effects at all can also be inferred in one instance (Example 51).	50. Side effects from immunotherapy can vary depending on the type of treatment you receive and how your body responds. (*Cancer Council*) 51. You also might have heard that immunotherapy doesn't have side effects. But that's not always the case. (*MDAnderson*)
2. Conflicting constructions of *Expectedness* along with *Comprehensibility:Incomprehensible*	- Construction of predictability: 'common side effects' (eight instances) - Problematisation of the unknown (two instances): 52. Unfortunately, when immunotherapy does cause severe side effects, they are highly unpredictable. (*Asbestos.com*)
3. Modal verbs with *Reliability:Medium/Low* frequently precede mentions of side effects, especially in the case of high severity or seriousness (52 instances)	53. . . . may also cause severe or even fatal allergic reactions. (*U.S. National Cancer Institute*) 54. . . . some may be mild but others can be quite severe. (*FORCE*)

4. Quantifiers are sometimes employed to emphasise that *Emotivity:Positive* results are more usual than *Emotivity:Negative* ones (four instances)	55. Still, immunotherapy can, **on rare occasions**, cause other serious medical problems. (*Cancer.Net*) 56. **Most** side effects of immunotherapy are mild and go away once the body gets used to the drug. (*Canadian Cancer Society*)

Overall, through this parameter-based analysis of WeCS, we could see in much more detail how the status of being new and the concerns over many decisive factors, especially side effects, that have been previously observed are constituted by various evaluative strategies: making a range of comparisons/contrasts (*Expectedness:Contrast/Comparison)*, using mainly the *Low/Medium* level of *Reliability,* or passing further evaluation on to experts. The *Importance* parameter has a consistent construction, whereas both opposing sub-values of *Emotivity* could be found.

In summary, the parameter-based analysis of both sample corpora has revealed:

(i) The similarities between the two samples include the consistent use of metaphorical *Definitions*, prominence of four types of evaluation (*Importance, Emotivity, Reliability,* and *Expectedness*), generally similar comments on *Importance* and *Cost*, and conflicting representations of *Development over time, Potential, Caution*, *Effectiveness*, and *Side effects*.

(ii) The differences between the two samples concern the construction of novelty, aspects of *Importance,* and WeCS's more diverse patterns within *Caution* and *Side effects.*

Appendix A.5 provides a list of all the parameters found in NeCS and WeCS for each topic, theme, and message.

Discussion

In the two corpora and their samples, the collocational relationships and the evaluation-embedded interactions of the items around *immunotherap** have shed light on how the evaluative prosody of this

treatment group is linguistically constructed. This section presents and discusses the answers to the research question by highlighting the convergence and dissonance of different evaluative strands identified from the two analyses above.

Common threads

Four observations on evaluative prosodies have been consistent in both types of analysis. First, the themes of evaluation (*Development over time, Potential versus Caution* in both sample corpora) correspond to the themes of collocation (*Time* and *Potential* in both corpora and *Problem* in WeC). Second, these corpora are characterised by the discourse of hope, as indicated by the collocational themes of *Potential* and *Success* in both corpora and the greater proportion of *Emotivity:Positive* compared to *Emotivity:Negative* in both samples (see Table 7). Third, news writers have a tendency to invite evaluation from multiple sources, as can be seen from the theme *Quotation* in NeC and the parameter *Evidentiality* in NeCS. Fourth, compared to NeC, information offered by health organisations in WeC tends to express more concerns over disadvantages and side effects, as evidenced by (1) 'side_effects' being among the top collocates in WeC; (2) the collocational theme *Problem* present in WeC; (3) the relatively higher proportion of the topic *Side effects* in WeCS (see Table 6); as well as (4) more explicit advocacy for seeking further information or professional counsel that can be seen within the theme of *Caution* in WeCS.

The parameter-based analysis has also revealed three consistently constructed evaluative patterns that could not be detected from the examination of collocates alone. First, there are two topics with consistent patterns of evaluation in both sample corpora: *Definition*, which is unfailingly portrayed through metaphors that evoke *Emotivity:Positive* and *Importance:Important*, and *Cost*, in which *Emotivity:Negative* is used throughout to highlight low affordability. This unchanging message within *Cost* is not surprising given that newly available or approved treatments are rarely covered by health insurance, thus becoming remarkably high-priced.

Second, across both sample corpora, the only parameter whose sub-values are construed in a consistent manner is *Importance* (in *Development over time, Potential*, and war-related metaphors). There is no debate around the current significance of immunotherapy within science and healthcare; even when *Importance:Unimportant* is mentioned, it only refers to the past to underline increasing importance in the present or future. The time period of data collection may have played a role in this unanimous portrayal of importance in the news articles, as datasets are all relatively recent: the news data were collected within two months before and after the Nobel Prize for two immunotherapy researchers in 2018, and the data of web pages were retrieved in July 2019, which is after the same milestone.

The third feature is different from the other two above as its pattern is relatively consistent within WeCS, but not NeCS: regarding *Reliability*, *Low* and *Medium* sub-values dominate. This aligns with findings in Sarangi and Clarke's study on communicating genetic risks, in which they found that hedging devices are the primary tool of formulating uncertainty used by geneticists to avoid giving overt advice to patients. Pointing out that uncertainty is an inherent feature of health communication and the act of giving information can be easily interpreted as giving advice, these authors suggested that using different types of hedges could help foreground information-giving and avoid the possible litigation that accompanies advice-giving. This tendency to sidestep advice-giving offers one explanation for the observations made above where writers actively urge readers to seek medical evaluation from their healthcare team.

Conflicting depictions

Despite the consistencies above, other aspects of this treatment group attract conflicting sub-values, as summarised in Appendix A.5. In NeCS, the presence of both *High* and *Low* sub-values in *Reliability* concerns two issues: the possibility of immunotherapy replacing other treatments in the future and the expression of hope for further scientific achievements

and better outcomes for patients. Notably, the former discussion does not come up in WeCS. Such variations within and across samples point to areas where information seekers might have trouble processing and what healthcare staff might need to address during consultations.

Another issue in which the duality of opposing sub-values is likely to be of concern to readers is side effects. Within the topic *Side effects,* which includes mild to severe ones, *Positive* and *Negative* sub-values of *Emotivity* co-exist in each sample corpus. The collocate 'side_effects' features much more prominently in WeC compared to NeC, and as WeCS is larger than NeCS, it is reasonable that *Side effects* in WeCS displays more complex patterns of evaluation. Another difference is that WeCS does not only briefly mention side effects as NeCS does, but presents and categorises them as, for example, 'common' (*Expectedness:Expected*), or 'unpredictable' *(Expectedness:Unexpected* and *Comprehensibility:Incomprehensive*). These discussions on side effects reflect a crucial concern in health information at large, as many researchers have recommended that side effects should be an indispensable part of written treatment-related information (Charnock et al.; Genova et al.; Jørgensen and Gøtzsche; Ream et al.). Thus, the fact that WeC and WeCS provide detailed descriptions of side effects exemplifies health organisations' attempts not to mislead readers or exaggerate the potential of these treatments. However, such contradicting evaluations may still be a source of anxiety to readers.

Conflicting information and opinions are not only shown through opposing sub-values but also through constructions of *Expectedness:Contrast* and *Expectedness:Contrast/Comparison.* These constructions are employed in various messages in both samples, but most notably in three discussions: *Being different or unique* (within *Development over time), Caution,* and *Limitations* (within *Effectiveness).* Through these parameters, we could observe the concessive pairings that have been described by Gill and Babrow as 'back-pedaling' in their study of breast cancer in women's magazines, 'because it seemed that these authors took two steps forward, then, realizing they had gone too far, took a step back' (142). Gill and Babrow pointed out that placing more positive

information first is either a rhetorical strategy to draw readers' attention or a testimony to the 'ambivalence on the part of journalists who wanted to provide very hopeful news but realized that the extremity of the hopeful news they provided was misleading' (142). On the other hand, placing less positive, uncertain, or cautionary information first has been identified by Leydon as a communication strategy much used by doctors in spoken encounters with patients to maintain hope. Leydon calls the phenomenon 'the power of proximateness', which 'refers to how doctors routinely organised information so that the relatively good followed the bad or uncertain' (1084), a turn design that enables doctors to emphasise the second part of the turn, sometimes explicitly by adding 'which is good' (1085). Although Gill and Babrow described journalists' styles and Leydon examined doctor-patient conversations, both of the strategies they identified could be observed in each of the sample corpora in this study.

Taking into account both the consistent messages and the conflicting evaluations that are present in the corpora and their samples, and the influences online information can have on patients' treatment decisions, it could be argued that whether information comes from news agencies or health organisations, readers are advised to utilise both sources with discernment, i.e. not to expect definitive advice in favour of or against the treatments. If readers seek to be well-informed, web pages from health organisations may be more helpful than news articles, because the former is more likely to explicitly advise readers to seek more information and make a greater attempt to sound the alarm about side effects, although as we have seen, the inconsistencies in its evaluation of side effects can still pose a challenge. This challenge is not just to readers but to health communication at large, because, as Han et al. pointed out, uncertainty stemming from probability, imprecision, lack of evidence, or conflicting opinions are unavoidable and irreducible. On the other hand, uncertainty resulting from the complexity of the information being discussed is essentially reducible (ibid.). News writers and organisational web writers could help reduce such complexity by providing accessible explanations

and guiding readers to more comprehensive sources, including health professionals, that can offer more detail or clarification on the treatments.

Conclusion

This study has examined the linguistic construction of the evaluation of cancer immunotherapy within a corpus of online news articles and another corpus of health organisations' web pages. To explore evaluation, two approaches were adopted, one from corpus linguistics (evaluative prosody), and the other built upon the literature of evaluative language (parameter-based framework). To identify the thematic groups of lexical items that reflect frequently discussed evaluative topics around the term *immunotherap**, I first examined its top collocates. Two collocational measures, MI and LL, were used to generate the top high-frequency and high-exclusivity collocates. The analysis then focused on identifying the similar semantic and discursive features of the top lexical collocates. A total of seven thematic groups emerged from the corpora, reflecting the broad areas of meaning often found around the term. Five of these themes are present in both corpora, suggesting five common discussion points: (1) biomedical and scientific processes, (2) variety of treatments and effects, (3) recent developments, (4) hopeful expectations, and (5) existing successful results. At the same time, the two corpora differ in two themes: in the news articles, (6) reporting verbs frequently occur near the term due to the use of quotation, while in the web page texts, (7) concerns over side effects or ineffectiveness constitute a notable theme. Within four out of these seven themes, specifically (3), (4), (5), and (7) above, the repeated interactions between the term and its collocates have been shown to carry relatively explicit evaluation and, thus, contribute to its evaluative prosody.

To explore specific types of evaluation constructed in each dataset, I examined two samples of the corpora. These samples are composed of the instances in which *immunotherap** or the noun phrase comprising it is placed in the subject position of the immediate sentence or clause containing it. Each sample covers six main categories: *General comments, Definition, Effectiveness, Side effects, Cost,* and *Others* (biomedical and

clinical information). The analysis focused on the *General comments*, which cover multiple topics and demonstrate the most complex patterns of evaluation compared to the other categories. All the instances in *General comments* were annotated with the evaluative parameters identified in Bednarek's framework. In terms of frequency, *Emotivity*, *Expectedness*, *Importance*, and *Reliability* are the four most prominent parameters in both samples, and *Comprehensibility*, although having limited occurrences, accounts for similar proportions in both samples.

The analysis then described in detail how the sub-values of these five parameters were used and combined in *General comments* as well as in the other categories. Consistent evaluative patterns have been found in statements related to *Definition* and *Cost* in both samples, with the former being characterised by *Emotivity:Positive* and *Importance:Important* and the latter *Emotivity:Negative. Importance:Important* is salient not only in *Definition* but throughout the two samples. Specifically, the increasing significance of the treatment from the past up to the present and the impact that it is expected to have in the future are highlighted by both sub-values of the *Importance* parameter. As noted in the *Discussion* section, the relative recentness of the datasets may have contributed to such constructions.

While some topics and evaluative sub-values underpin similar representations of the treatment in both samples, others reveal conflicting messages that may cause anxiety to readers. Multiple inconsistencies have been identified in the topic of *Side effects*. In both the news and web page samples, *Positive* and *Negative* evaluators of *Emotivity* have been found to characterise different levels of severity. Moreover, within the web page sample, where side effects are a much more prominent topic, two contrasting sub-values of *Expectedness*, i.e. *Expected* and *Unexpected*, have been observed in constructions of likelihood and predictability. Apart from side effects, another potential source of confusion to readers concerns the other two sub-types of *Expectedness* focusing on contrast and comparison. They could be seen in both samples, most clearly in discussions on *Being different or unique*

(within *Development over time), Caution,* and *Limitations* (within *Effectiveness)*. One notable feature is the use of contrastive pairings, in which a more hopeful or positive message follows or precedes an uncertain, cautionary, or less positive one. I have argued that, in each sample, these pairings resemble not only the discursive strategy found in magazine articles about breast cancer (Gill and Babrow) but also the one used by doctors during oncology consultations (Leydon). Conflicting messages are also constructed through the evaluation of *Reliability*. As noted in the *Discussion* section, the prevalence of *Reliability:Medium/Low* within the web page sample reflects a tendency to employ hedges to communicate uncertainty and avoid advice-giving. Despite that pattern, overall, *Reliability* is still inconsistently represented as all three sub-values, i.e. *Low*, *Medium*, and *High,* have been found in each sample.

The collocation and parameter-based analyses together have provided complimentary insights into the evaluation of cancer immunotherapy. The topics and types of evaluation observed around the term indicate that its evaluative prosody, defined as the interaction between a lexical unit and other items carrying evaluation, is complex and may vary according to text types. Although both analyses have shown that the two corpora centre on three main topics of evaluation, i.e. temporal development, potential, and drawbacks, the specific issues addressed in each corpus are different in multiple ways. Similarly, despite both corpora having the same four most common evaluative parameters, among which *Importance* is consistently constructed, the sub-values of *Reliability*, *Emotivity*, and *Expectedness* constitute divergent or contradictory messages. Overall, hopeful comments and predictions are prevalent in both corpora, but, in web page texts, drawbacks and concerns are also emphasised. Therefore, as noted in the *Discussion* section, it is important for readers, including patients and carers, to be aware of where and how such evaluative strands converge and diverge in these non-specialist genres, so that they can be motivated to seek more information and avoid forming their opinions of the treatment based on only one news or web article, source, or text type. It may be useful for professional writers specialising in

health communication to be mindful of the conflicting evaluations that are present across multiple texts, as these writers could explicitly discuss potential causes of confusion or anxiety and promote information-seeking behaviour. It is also potentially beneficial for healthcare providers to be aware of both the consistencies and inconsistencies in these text types, in order to have open discussions about such contents with patients and carers.

The combination of quantitative and qualitative methods adopted in this study provides a useful approach to the examination of key concepts or entities. Whereas previous studies, such as those that explore 'financial crisis' (Schröter and Storjohann) and 'climate change' (Grundmann and Krishnamurthy; Jaworska), have not gone beyond collocation analysis, this study has taken a further step by conducting a qualitative analysis of all the occurrences in which the key term is topicalised in the subject position of its clauses or sentences, thereby allowing for a much more fine-grained level of observation and addressing the long-standing criticism levelled against the 'simplistic' good-bad evaluation (Hunston "Semantic Prosody" 256). Analysing the sample corpora comprising these occurrences and their co-texts has proven to be highly useful in unpacking more unsubtle evaluation. Firstly, the samples contain many of the top noun and adjective collocates, thus facilitating an in-depth examination of those items. Secondly, the samples are also representative of the complete corpora as their major evaluative themes are reflective of the themes identified in the top collocates. However, as the study centres on *immunotherap**, it necessarily ignores other possible types of constructions and references (e.g. by using pronouns or using names of specific drugs or treatment sub-categories), which could be explored in future research. As NeC consists of international news within a five-month span and WeC represents popular online search results at a specific time, they could not reflect how the representations of immunotherapy develop over many years or vary across cultural contexts. For that purpose, looking into diachronic changes over, for example, a decade, or collecting data from specific

countries will be useful. As this study only focuses on written texts produced by journalists and health professionals, future research exploring online information seekers' perspectives can reveal patterns of evaluation that are different from what we have seen so far.

Finally, language not only reflects social entities but also actively constructs them (Candlin et al. 323) and '[d]iscourses are constantly changing, interacting, merging, reproducing and splitting off from each other' (Baker *Public Discourses* 17). As knowledge about immunotherapy is still expanding, the construction of its evaluation is expected to change and potentially (re)shape patients' perceptions of their treatment choices. Thus, the evaluative language around immunotherapy will continue to be an interesting research subject. This study contributes to the formation of a future body of research that will explore the public evaluation of cancer treatments and medical advances through the lens of applied linguistics.

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APPENDICES

A.1 The top collocates in NeC with Log-likelihood

No.	Left	Freq.	LL	Right	Freq.	LL	Middle	Freq.	LL
1	the	477	1776.84	is	175	784.74	are	50	151.97
2	of	305	1160.69	a	181	568.58	approach	10	46.00
3	cancer	214	828.39	in	172	536.39	already	10	44.14
4	to	238	773.00	and	153	414.28	trials	12	43.37
5	that	106	329.16	for	116	394.81	when	14	37.77
6	with	85	288.33	treatment	84	360.77	royal	6	31.63
7	new	55	230.41	drugs	52	274.14	medicine	10	25.63
8	said	53	181.19	which	54	229.77	several	6	22.53
9	combination	24	155.43	drug	49	228.59	year	8	16.62
10	this	45	138.03	has	57	227.63			
11	field	20	131.06	chemothe-rapy	44	214.92			
12	on	43	113.68	as	57	189.85			
13	trial	26	110.48	patients	55	164.83			
14	an	34	108.95	more	36	133.81			
15	now	23	90.55	uses	18	126.82			
16	first	24	90.42	body's	21	117.15			
17	targeted	14	85.04	have	39	112.89			
18	development	15	83.26	used	22	106.30			
19	there	22	81.54	be	38	105.67			
20	use	16	80.44	at	38	99.10			

A.2 The top collocates in NeC with Mutual Information

No.	Left	Freq.	MI	Right	Freq.	MI	Middle	Freq.	MI
1	pioneering	8	6.45	extends	5	7.26	royal	6	5.04
2	show	11	6.13	platform	6	6.85	approach	10	4.58
3	involves	5	6.00	promise	9	6.11	already	10	4.45
4	germany	5	5.88	uses	18	6.11	several	6	3.99
5	field	20	5.83	service	5	5.88	trials	12	3.88
6	combination	24	5.78	promising	9	5.68	are	50	3.42
7	marsden	5	5.77	extend	5	5.49	when	14	3.19
8	combining	6	5.76	therapeu-tic	5	5.49	medicine	10	3.08
9	targeted	14	5.54	medica-tion	7	5.37	patient	6	3.04
10	effectiveness	5	5.49	currently	11	5.33			
11	development	15	5.21	memorial	8	5.31			
12	chief	8	5.13	body’s	21	5.23			
13	offered	5	5.12	option	7	5.21			
14	breakthrough	10	5.09	combined	7	5.07			
15	advances	8	5.09	drugs	52	5.00			
16	along	5	5.06	atezolizu-mab	9	4.94			
17	recently	7	4.98	nivolumab	7	4.90			
18	using	15	4.98	sloan	5	4.88			
19	chemo	7	4.90	tested	5	4.88			
20	use	16	4.87	shown	9	4.88			

A.3 The top collocates in WeC with Log-likelihood

No.	Left	Freq.	LL	Right	Freq.	LL	Middle	Freq.	LL
1	of	661	2816.19	is	434	2099.19	it	70	150.95
2	cancer	535	2027.43	to	410	1160.49	ways	26	107.04
3	the	635	1896.87	for	272	1124.38	doctors	22	85.63
4	immunothe-rapy	335	1337.56	are	271	967.86	certain	22	76.47
5	types	158	879.13	a	258	731.39	well	20	70.93
6	effects	156	691.91	treatment	171	657.36	effective	16	66.30
7	what	111	666.41	in	228	649.88	field	10	49.71
8	side	153	653.50	treatments	101	461.75	reactions	10	41.17
9	and	271	628.47	different	77	428.98	science	8	37.90
10	how	109	554.94	can	127	413.52	forms	10	37.80
11	you	107	421.17	work	91	409.26	approach	10	36.33
12	type	81	380.26	some	98	360.40	any	12	35.53
13	about	69	315.19	drugs	86	358.87	wide	6	34.72
14	with	115	314.34	clinical	87	357.33	severe	12	34.30
15	new	66	310.27	may	94	346.40	their	16	29.90
16	other	90	304.55	as	116	339.69	were	12	29.81
17	non-specific	35	303.81	that	131	310.01	oncolytic	8	23.67
18	more	76	259.61	immune	146	307.48			
19	several	42	231.15	your	95	290.26			
20	checkpoint	60	206.78	be	95	284.77			

A.4 The top collocates in WeC with Mutual Information

No.	Left	Freq.	MI	Right	Freq.	MI	Middle	Freq.	MI
1	cutting-edge	5	6.30	video	5	6.30	wide	6	5.10
2	non-specific	35	6.25	biologic	22	5.97	field	10	4.65
3	advantages	7	6.20	harnessing	6	5.75	science	8	4.51
4	passive	14	6.07	2019	5	5.71	effective	16	4.14
5	behind	7	5.75	refers	5	5.71	reactions	10	4.13
6	adjuvant	5	5.71	harnesses	6	5.56	ways	26	4.12
7	visit	6	5.71	suitable	9	5.56	doctors	22	3.97
8	active	23	5.45	exciting	13	5.43	forms	10	3.90
9	fda-approved	7	5.32	experimental	6	5.39	approach	10	3.80
10	challenges	5	5.30	program	17	5.36	well	20	3.74
11	what	111	5.18	management	8	5.27	certain	22	3.69
12	history	5	5.13	medicines	27	5.24	any	12	3.33
13	question	5	5.13	widely	10	5.21	oncolytic	8	3.33
14	combining	8	5.06	promising	23	5.14	severe	12	3.26
15	long-term	11	5.04	discuss	8	4.97			
16	immunology	7	4.97	having	9	4.97			
17	benefits	21	4.94	join	5	4.97			
18	several	42	4.94	different	77	4.97			
19	types	158	4.93	everyone	13	4.92			
20	form	24	4.92	comes	7	4.87			

A.5 A summary of findings on evaluative parameters

		NeCS	WeCS
General comments			
1	**Development over time**		
1.1.	Being new	*Emotivity:Positive*	*Emotivity:Positive*
1.2.	Being new only to a certain extent	*Expectedness:Contrast* *Expectedness:Contrast/ Comparison*	*Reliability:Low/Medium*
1.3.	Challenges due to being new		*Comprehensibility:Incomprehensible*
1.4.	Being different or unique	*Expectedness:Contrast/ Comparison (Expectedness:Unexpected)*	*Expectedness:Contrast/ Comparison (Expectedness:Expected)*
1.5.	Growing importance in science and medicine	from *Importance:Unimportant* in the past to *Importance:Important* in the present	*Importance:Important*
1.6.	Growing media publicity		*Importance:Important*
1.7.	The possibility of replacing other treatments	*Reliability:Low* *Reliability:High*	
2	**Potential**		
2.1.	'breakthrough', 'promise/ promising'	*Emotivity:Positive and Importance:Important*	*Emotivity:Positive and Importance:Important*
2.2.	'miracle'		*Expected:Contrast* *Reliability:Medium/Low*
2.3.	'exciting'		*Emotivity:Positive*
2.4.	Being hopeful	*Emotivity:Positive and Expectedness:Expected* *Reliability:Low* *Reliability:High*	*Emotivity:Positive and Expectedness:Expected* *Reliability:Low*
3	**Caution**	*Expectedness:Contrast* *Emotivity:Negative*	*Comprehensibility:Incomprehensible* *Expectedness:Contrast* *Emotivity:Negative*

			Distancing writers from the need to evaluate
Other topics			
1	**Definition**		
1.1.	Warfare metaphors	*Emotivity:Positive and Importance:Important*	*Emotivity:Positive and Importance:Important*
2	**Effectiveness**		
2.1.	Successful results	(Consistently tied to a particular type or group of cancers or patients rather than all cases)	(Half of the comments on successful results do not mention specific types of cancer or patients and only provide a general overview)
2.2.	Limitations	*Expectedness:Contrast Expectedness:Contrast/ Comparison Emotivity:Positive Comprehensibility:Incomprehensible*	*Expectedness:Contrast Comprehensibility:Incomprehensible*
3	**Cost**	*Emotivity:Negative*	*Emotivity:Negative*
4	**Side effects**	*Emotivity:Positive Emotivity:Negative*	*Expectedness:Expected Expectedness:Unexpected Comprehensibility:Incomprehensive Reliability:Medium/Low Emotivity:Positive Emotivity:Negative*