Development of a Clinical Nursing Word List

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ABSTRACT: Nursing students who study in a foreign language face significant barriers to success. In particular, reading and listening comprehension have been identified as challenges for English language learners. Several studies have examined language use in nursing and medical journals but there is a lack of focus on oral vocabulary. This study aimed to identify nursing-specific oral vocabulary that is used in clinical instruction. 63.6 hours of clinical instruction was recorded and analyzed. Over 40% of vocabulary was not contained in common English and Academic word lists used to guide foreign language vocabulary instruction. Current results suggest that a considerable technical vocabulary exists for the nursing profession. It is possible that identification of this vocabulary and its incorporation in pre-nursing studies may have benefits for foreign language nursing students. Comparison of results with similar studies reveals apparent differences in vocabulary use between medicine and nursing, and between oral vocabulary and vocabulary from nursing journal articles. These differences highlight the importance of incorporating a broad range of data sources to develop a comprehensive set of nursing-specific vocabulary.

Keywords: Nursing, Corpus, Lexicon, Technical vocabulary, English for academic purposes, English for nursing purposes, Nursing academic word list

RESUMÉ: Les étudiants en soins infirmiers qui étudient dans une langue étrangère, font face à de sérieuses difficultés avant de réussir ; notamment en compréhensions écrite et orale qui sont reconnues comme étant des obstacles pour les apprenants en anglais. Dans certaines études, on a analysé la langue employée dans les revues médicales et de soins infirmiers et l'on a constaté une grosse lacune en termes de lexique utilisé à l'oral. Ici, le but est de cerner le lexique utilisé à l'oral dans les soins infirmiers et qui est employé dans l'enseignement clinique. Après avoir enregistré et « disséqué » 63 heures 6 d'enseignement clinique, on a remarqué que plus de 40 % du vocabulaire ne faisait pas partie de l'Anglais courant et des

listes lexicales scolaires que l'on utilise dans l'enseignement d'une langue étrangère. On peut donc conclure que dans le métier d'infirmier(ère), le vocabulaire technique prend une place très importante. Il se peut que la reconnaissance de ce vocabulaire et son intégration dans les études préalables de soins infirmiers, soient profitables aux étudiants de langue étrangère de cette discipline. Si l'on compare des études semblables, le vocabulaire employé en médecine et celui qui est employé dans les soins infirmiers, montre des différentiations. Il en va de même pour le vocabulaire employé à l'oral et celui qui est écrit dans les revues de soins infirmiers. Ces différences soulignent donc l'importance d'intégrer une large base de sources de données afin d'offrir un ensemble compréhensif pour un lexique spécialisé en soins infirmiers.

Mots-clés : soins infirmiers, corpus, lexique, vocabulaire technique, l'Anglais scolaire, l'Anglais pour les soins infirmiers, liste de vocabulaire scolaire en soins infirmiers

Introduction

Language use in nursing is a current topic of global importance to the profession. Developing and employing a set of vocabulary that is consistent across practice settings has potential to advance clinical outcomes by improving patient care, reducing errors and improving patient safety (NANDA, 2009). It can also help to clarify roles, describe service delivery, and facilitate development of electronic health records (Duff, Endsley, Chau, & Morgitan, 2012). Standardized language can also enhance nursing education, research and administration and can help advance the profession by facilitating the identification and evaluation of the work nurses do inside and outside of clinical settings (Rutherford, 2008). The wide variety of benefits suggests that standardizing oral and written nursing language is essential to the profession. This article will document the identification of technical clinical nursing vocabulary and argue that oral vocabulary in nursing differs from other disciplines and also from nursing word lists derived from journal articles.

In Qatar, language use in nursing and other health professions is a particularly important issue given the diversity of health professionals in terms of language and cultural background. The official working language in hospitals throughout the country is English. Accordingly, all health professions programs are delivered in English. In Qatar, throughout the Gulf region, and worldwide, there are numerous schools of nursing that offer English language nursing programs to non-native speakers. Studying nursing in a foreign language presents significant barriers to comprehension and retention, can drain faculty resources, and can reduce the amount of content covered (Eames, 2014; Ndawo, 2014).

Institutions with large numbers English Language Learners (ELL) often have departments that provide English language instruction and support. Two important resources for ELL programs are the General Service List of English Words and the Academic Word List. The General Service List contains the

2000 most frequently used word families in the English language (West, 1953). Although the list was developed over 60 years ago it continues to be a relevant reference since it typically covers 80% of vocabulary in academic texts (Yang, 2015). The Academic Word List contains an additional 570 word families and was developed from a collection of academic journals and textbooks from the arts, commerce, law and natural science (Coxhead, 2000). The combination word families from the General Service List and the Academic Word List make up approximately 90% of words used in academic texts. The remaining 10% consist of vocabulary that occur with low frequent and high frequency technical words.

Literature Review

There have been two recent literature reviews that specifically focused on the needs and challenges of ELL nursing students (Crawford & Candlin, 2013a; Olson, 2012). Both reviews identified a common theme of extra burden associated with learning technical Nursing vocabulary in addition to general English. ELL nursing students thus face specific and significant challenges, both academically and in the clinical setting. Many of these students require significant levels of support in order to be academically successful in nursing programs, and to perform at levels that are expected during clinical placements (Boughton, Halliday, & Brown, 2010; Brown & Anema, 2007). However, the success of English language support programs in promoting academic language proficiency have had mixed success, indicating a need for further research (Boughton et al., 2010; Brown & Anema, 2007; Crawford & Candlin, 2013a; Olson, 2012).

A review of literature by Starr (2009) found that ELL students encounter complex language and cultural challenges, which cannot necessarily be mediated through "special attention and additional classes" (p.486) because they lack a learning context for the instruction. Another study suggested that improvements to English language support programs for ELL nursing students should include increasing nursing related content (Crawford & Candlin, 2013b). A study undertaken to promote academic achievement for first year ELL nursing students in Australia stressed that ELL nursing students would benefit from teaching strategies that help them acquire the nursing language they need for understanding classroom discussions and lectures, instead of generic language programs (Salamonson, Everett, Koch, Andrew, & Davidson, 2008).

Listening comprehension is a meaningful, interactive process that involves interpretation and reaction to spoken language for an overall understanding of the message (Hasan, 2000). A significant factor that hinders listening comprehension is the introduction of new technical terminology (Crawford & Candlin, 2013b; Flowerdew & Miller, 1992). Many ELL nursing students experience difficulties with spoken English during clinical placements in particular, where textbooks and journal articles are not always readily accessible (Guhde, 2003; Miguel, Rogan, Kilstoff, & Brown, 2006). Studies have shown that pre-listening activities facilitate foreign language listening comprehension

(Elkhafaifi, 2005; Farrokhi & Modarres, 2012). San Miguel et al. (2006) developed an intensive clinical language workshop for ELL nursing students to address clinical comprehension issues. Teaching approaches included strategies for learning medical technology and words typically used together. A follow up assessment of the language program after three years found that early intervention language programs contributed to greater success and confidence for students (Miguel et al., 2006). However, it is difficult to know which vocabulary are most important and relevant. There are several examples in the literature that attempt to address these issues through the development of word lists that are inclusive of technical vocabulary.

Wang et al. (2008) examined specialized medical language utilizing a selection of medical journals from 32 different medical fields. This resulted in a Medical Academic Word List of 623 word families occurring with high frequency that were outside of common English vocabulary lists. The authors suggested that future work should be done to examine spoken medical academic English. Likewise, Budgell et al. (2007) developed and analyzed a pilot corpus created from textual analysis of articles found in a representative set of 6 English-language nursing journals. The authors state that although the development of a corpus using nursing journals is an efficient way of identifying the language used by the nursing profession, the written language cannot be expected to be representative of the spoken language, and therefore there is a need to develop a corpora of the oral language used in both the classroom and clinical areas (Budgell et al., 2007). Yang (2015) produced a comprehensive nursing academic word list by examining a selection of 252 nursing research articles from 21 different practice areas (e.g., cardiology, obstetrics, urology, etc). This nursing academic word list contains 676 word families, which account for 13.64% of the words used in the selected articles. Yang argues that the discipline specific word list is superior to Coxhead's (2000) Academic Word List for use in teaching ELL nursing students because the nursing academic word families occur more frequently in the selected articles than the word families from the Academic Word List. However, caution should be taken in adopting this nursing academic word list due to its focus on academic journals. On inspection of the most frequent words in the list, its relevance to undergraduate nursing practice is questionable. For example, the top ten words in the list are "participate", "significant", "data", "research", "clinic", "analyze", "assess", "score", "respond", and "symptom". The majority of these words relate specifically to the research process or design. It could be argued that this list is not valid for teaching and learning at the undergraduate level due to the lack of inclusion of textbook or oral vocabulary. This highlights the need for research related to clinical nursing communication and nursing textbook language.

Rationale and Aims

At the University of Calgary in Qatar a Nursing Foundations Program is offered to assist beginning students in reaching an adequate proficiency in

English (and other subjects) before commencing courses specific to nursing. Students enter the English for Academic Purposes (EAP) Program at one of four levels, depending on their English ability, and progress though these levels as their proficiency increases. Once they finish EAP level 4 they enter the formal Nursing Program. EAP students learn vocabulary derived from the General Service List for English and Academic Word List. Despite this support for ELL students, they continue to struggle with language difficulties throughout the Nursing program. One potential reason for this is the lack of focus on technical vocabulary. Several initiatives, including this project, have been undertaken to address this issue by identifying high frequency technical nursing vocabulary.

This study aims to explore the most frequent technical nursing vocabulary used in oral clinical instruction at the University of Calgary in Qatar. Technical vocabulary is defined as nursing-related words that are unique to nursing or have specialized meaning, and are not included in the General Service List for English or the Academic Word List (Coxhead, 2000; West, 1953). Clinical courses were chosen because nursing is primarily a practice-based profession and undertaking exploratory work with potential to improve clinical performance was seen as a priority. We focused on oral vocabulary because 1) clinical instruction and learning is primarily oral, and 2) this type of vocabulary has been neglected in the literature. The hypothesis is that a list of technical vocabulary will be identified, enabling the creation of a Clinical Nursing Word List (CNWL).

Current results add to the global discourse on the standardization of nursing language by providing a valid collection of practically employed oral instructional vocabulary. Locally, the intent is to enhance nursing instruction by providing data that can be used to improve the consistency between vocabulary instruction in our EAP program and language use by Nursing Instructors. In addition to these benefits, this study also has the potential to serve as a model for other post-secondary institutions in Qatar, the Gulf region, and worldwide who offer a foundation/bridging program for non-native speaking students. Moreover, the method of identifying technical instructional vocabulary holds potential to improve teaching and learning outcomes for non-native speakers regardless of their program of study.

Methods

This is a quantitative, cross sectional study where data were collected during several consecutive classes. However, change across time was not analyzed, and data are treated as if they were collected at a single time point. Ethical clearance was obtained from the University of Calgary's Conjoint Health Ethics Review Board. Potential participants were approached by members of the study team, the research was explained, and written informed consent was obtained prior to enrollment in the study.

Setting

The University of Calgary in Qatar is a transnational post-secondary branch campus, located in the Middle East region. The campus was established in 2006 as an initiative to strengthen the quality of nursing education in Qatar and to improve the image of nursing in the region. As of the 2014 Fall Semester there were 463 registered students, and 38 full time academic staff. The University delivers three Nursing programs: a Bachelor of Nursing regular track program for students with no previous Nursing background; a post-diploma program for students with an acceptable Nursing diploma; and, a Masters of Nursing program. Although all instruction is in English, students at this university are predominantly non-native English speakers, with the majority of those being of native Arabic language origin. A Nursing Foundations Program is also available for students who do not meet initial admission criteria for Math, Sciences, and/or English language ability. The University recently received a 7-year accreditation by the Canadian Association of Schools of Nursing, and the curriculum is based on the Nursing program at the University of Calgary in Canada. All Instructors are required to have valid Canadian nursing licensure.

Research Design

A quantitative computer-based text analysis design was used (Mercer, 2010). Oral instruction in the lab portion of clinical courses was audio-recorded and transcribed. A sample of transcriptions was checked to determine accuracy. Transcriptions were then analyzed to identify frequently occurring technical vocabulary and to develop an inclusive vocabulary list of oral clinical nursing instruction. Figure 1 illustrates the research design:

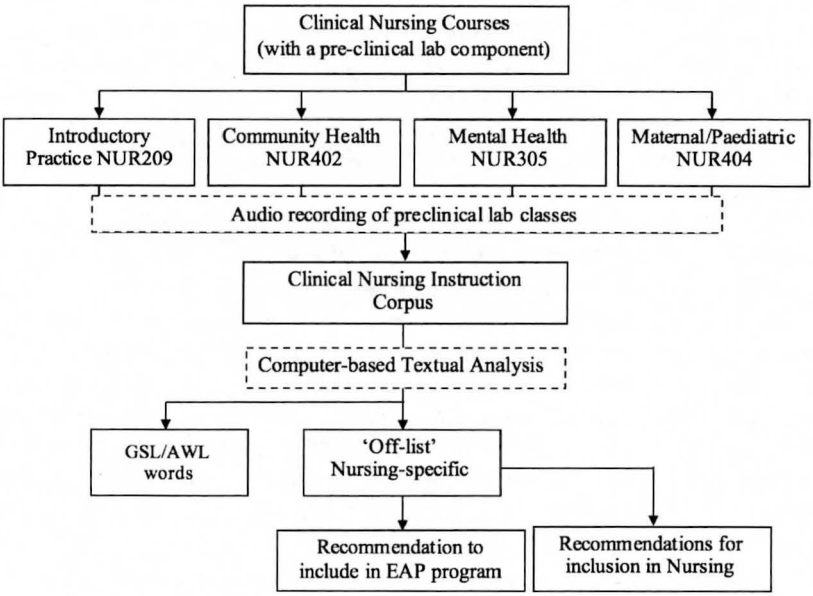

Figure 1. Illustration of the research design

Population and Sampling

Oral instruction during the lab portion of the following regular track undergraduate clinical courses was recorded: Nursing Practice, Mental Health Practice, Childbearing/Childrearing Families Practice, and Community Health Nursing Practice. These courses represent nearly the entire scope of clinical instruction at the University. Nursing Practice is a general course covering fundamentals of practice and the other three courses are specialized areas of practice that all students must complete. Childbearing/Childrearing Families Practice is a combination of two clinical courses: maternal health and pediatrics. There are two other basic clinical courses that we did not record. However, the content of these is covered in the Introductory Practice (NUR209) course, which aims to consolidate and build upon prior skills and knowledge. One additional non-basic clinical course, Adult Health Practice, was not included in this study because its timing in the 2013/2014 schedule makes data collection unfeasible. All instructors approached for recruitment agreed to participate. Although each of these clinical courses also included required readings, written vocabulary was not included in our sample. This decision was made based on the aim of the study, which was to explore oral vocabulary.

Data Collection

Each of the selected courses begins with a laboratory-situated component where key knowledge and skills are reviewed, prior to students entering the practice setting. The core skills and knowledge for each course are covered during this portion of the course. Oral instruction during laboratory classes is

broad and extensive, and reflective of hospital-based instruction. Data collection did not continue into the hospital-based portion of the courses due to confidentiality issues. Laboratory-based classes consist of 3-6 7-hour sessions at or near the beginning of the semester, depending on the course. The exception was the Community course, which had weekly 2-3 hour labs. All selected courses were offered during the Winter 2014 semester when data collection took place.

All enrolled instructors were provided with an audio recorder and given coaching on its use. Members of the research team delivered the recorder prior to the start of each class and ensured it was functioning properly. The devices recorded continuously until they were powered off at the end of the class. Audio recorders were placed in the breast pocket of the instructors' lab coat or attached to a lanyard around the instructor's neck. At the end of each class, audio recorders were collected from the participants and data was transferred onto a computer and briefly reviewed for quality. After all data had been collected, each recording was trimmed to eliminate periods with no data (e.g., during breaks). Trimmed audio files were sent electronically to a professional transcription service.

Audio recorders were tested extensively prior to commencement of the study to determine optimal settings and to test the recoding quality and capacity. The data collection process was piloted in a non-Nursing course in order to finalize the data collection protocol.

Data Analysis

Transcripts were checked for accuracy. Nine transcripts were selected at random. Each of the team members checked these transcripts against the original recording and recorded omissions and errors. Based on this, an accuracy rate was calculated. This process was piloted with the entire team in order to ensure consistency.

After accuracy of transcripts has been checked, a frequency analysis was conducted. First, transcripts were entered into VocabProfile Classic v4 (available at http://www.lextutor.ca/). This program separates text into its GSL, AWL, and off-list components. Off list words were extracted and then cleaned, by removing names, spelling errors, and artifacts (e.g., [laughter], [silence]) from the transcripts. Files containing the cleaned, off-list portion of the text were then imported into NVIVO ver10 and word frequency queries were run to determine the frequencies of off-list words. These lists were further cleaned to remove non-nursing words (e.g., Canada, Qatar) and develop the CNWL. We also grouped similar words (e.g., clinic, clinical, clinician) into word families to allow comparison to similar studies. The process of analyzing and cleaning the data was performed as a team and any questions or concerns were resolved by consensus.

Results

In total, 63.6 hours of audio data was transcribed. This included 20.2 hours of Introductory Practice, 10.1 hours of Mental Health Practice, 12.2 hours of Community Clinical and 21.2 hours of Maternity/Pediatrics (12.1/9.1hrs, respectively). Accuracy of transcripts was › 98%. Analysis revealed 9457 unique words, 4017 (42.5%) of which were off-list words.

The top ten most frequently occurring word families in each course are presented in Table 1. Medication (n=270 and 272, respectively) was the most frequent word used in both the introductory clinical course (Nursing Practice) and Maternity/Pediatrics. Interview (n=65 and 109, respectively) was the most frequently occurring word family in both Mental Health Practice and the Community Clinical Lab. The high frequency vocabulary differs between each class, and no single word appears in all four classes.

Nursing Practice		Mental Health Practice		Community Clinical Lab		Maternity/Pediatrics	
Word	**Count**	**Word**	**Count**	**Word**	**Count**	**Word**	**Count**
Medication	270	Interview	65	Interview	109	Medication	272
Catheter	148	Mood	56	Session	81	Vein	247
Sterile	130	Patient	49	Diabetes	73	Liter	236
Diagnose	113	Clinic	33	Patient	68	Fluid	164
Urine	109	Drug	31	Lab	65	Dose	155
Dose	104	Psychiatry	25	Informant	61	Partum	108
Math	89	Alcohol	23	Windshield (survey)	56	Pediatric	86
Drain	74	Nerve	19	Summative	48	Epidural	85
Drug	74	Agitate	18	Formative	44	Pregnant	84
Glove	73	Delusion	18	Stakeholder	43	Patient	69

Table 1. Top ten most frequent word families in each course.

The top 10 most frequent word families in all four courses combined appears in Table 2. Medication (n=557) is by far the most frequent word family across all courses, being used nearly twice as much as the second most frequent word (Liter, n=284). Table 2 also provides contextual examples of how the top ten word families were used by clinical Instructors.

Word	Count	Examples
Medication	557	So check the vial to make sure that you took out the right **medication**.
		Not all of [the patients] have exactly the same **meds**.
Liter	284	We'll often put 40 units in a bag, in a **liter**.
		You know the formula for calculating urine output is 2 **mL** per kilo per hour.
Vein	273	The largest **vein** that you see is not necessarily the best **vein** to use.
		Say the doctor wrote her **IV** rate as 50 mL per hour...
Dose	259	You need to know that the usual **dose** for this is 4 grams divided over 4 **doses**.
		The right patient, the right **dosage**.
Patient	242	A **patient** could also be a key informant.
		I'm sure there are tons published on diabetic **patients**.
Gram	235	**Microgram** and **gram** are very, very different.
		This patient weighs 75 **kg**.
Catheter	194	If people can't void, or are incontinent, we sometimes insert a **catheter**...
		And in the afternoon, we do **catheterization**, okay?
Fluid	186	So, we want to correct **fluid** and electrolyte imbalances.
		[Mothers] need **fluids** to make colostrum and [breast] milk eventually.
Lab	180	Yes, absolutely, [it is] a very, very expensive simulation **lab**.
		I put specifically on the **lab** outline what pages.
Clinic	175	They probably have an ultrasound **clinic** at both hospitals. When I am going to **clinical** I wake up [early] because I am afraid I will sleep in.
Interview	175	It would give me an idea of ... what information you found in your **interview**.
		When you are **interviewing**, opening is hard and closing is hard.
Sterile	175	So where are your **sterile** forceps now?
		Anything else that's been **sterilized** shouldn't have any moisture.

Table 2. Top ten most frequent word families in all classes combined. Examples from transcripts are provided.

Appendix 1 presents the top 100 word families in all classes combined, including the terms included in each family. Word frequency becomes sufficiently low toward the end of this list to bring the relative importance of terms into question. Hence, word families outside of the top 100 are excluded.

Discussion

Oral instruction during lab-based clinical courses was recorded and the audio data was analyzed to identify technical vocabulary. Over 40% of the words used in oral clinical instruction were not contained in common word lists such as the General Service List for English and the Academic Word List. By analyzing this 'off-list' vocabulary we were able to identify the most common

technical word families used in each course and across all courses combined. Vocabulary use appears to be different between classes since no single word family was included in the top ten most frequent words for each class. This suggests that while a broad, combined list may be beneficial for general English preparation, course-specific lists may also be beneficial.

The high proportion of off-list language use has implications for the listening comprehension, and learning outcomes, of foreign-language learners in clinical courses (Mulligan & Kirkpatrick, 2000). Pre-listening strategies can potentially be used to introduce vocabulary from the CNWL to students prior to them receiving oral instruction in nursing courses. These pre-listening strategies may enhance students' listening comprehension and improve retention of course content (Miguel et al., 2006). This approach will potentially remove some of the barriers ELL students face in clinical settings, and ultimately improve their chance for success in clinical courses.

Our results differ from the Medical Academic Word List developed by Wang et al. (2008). When comparing the top 30 words from both studies, only two word families (7%) appear on both lists: dose and clinic. The discrepancy between the two studies suggests that nursing language is different from medical language. However, the source of the vocabulary may also have contributed to the difference. Wang et al.'s raw data came in written form from medical journals, while our data came from an oral source. It seems likely that the language used when writing for an academic audience would be essentially different from the language used for introducing and reinforcing foundational concepts to students.

In contrast, current results are somewhat similar to the nursing corpus developed by Budgell et al. (2007). Although these authors did not distinguish between common and technical words, it is still possible to extract the technical words from their results. After doing so, there are 8 off list technical word families, three (37.5%) of which appear in the top 30 word list from our study: clinic, medication and patient. This comparison supports the notion that there is a difference between vocabulary use in medicine and nursing, although there is some overlap (e.g., clinic). Budgell et al.'s results were derived from nursing journals so again, it is difficult to make a reliable comparison to our results.

A difference was also observed between the current study and Yang (2015). Only two of Yang's top 30 word families, *clinic* and *surgery*, corresponded with our CNWL. The obvious difference being that current results are clinically relevant, where Yang's results are relevant to nursing research. Yang's study was prompted by challenges experienced by Taiwanese graduate students in reading and writing academic papers and abstracts. Hence, the development of a corpus and academic word list based on nursing journal articles may be appropriate for this population of students. However, it is not likely to be appropriate for students on clinical, or other non-academic trajectories. These students are required to read from a variety of sources, including journal articles, course materials (e.g., presentation slides, handouts, syllabuses, etc.), reliable websites, textbooks, hospital policies, ethics and competency documents, and more. Current findings demonstrate that language

use in clinical teaching differs from written academic vocabulary. This finding suggests that a wide range of sources is necessary in order to develop a comprehensive list of academic vocabulary for nursing.

Our study has several limitations. Due to the scope of the project we were not able to record data from all courses. It is possible that the language used in clinical courses may be different from that used in theoretical courses. However, since nursing is primarily a clinical profession, we feel that the decision to focus on clinical courses was sound. Even within clinical courses we were not able to capture the full scope. Data collection lasted for one semester only and so we were not able to capture data from several clinical courses. However, the breadth of clinical courses that were recorded covers a broad range of topics and most of the fundamental clinical knowledge. The data that was collected was unequally distributed across classes. For example, twice as many hours were recorded in the Introductory Nursing class. However, since all of the labs in each course were recorded, we feel that the unequal distribution is a valid representation of clinical language use. However, our analysis could have been strengthened with a larger data set and the inclusion of 'range' as a variable (see Coxhead, 2000; Yang, 2015).

Future research could address these limitations by including a much larger set of oral vocabulary, which would increase confidence in the results. Our analysis would also have been strengthened by comparing results to the New General Service List (Browne, Culligan, & Phillips, 2013b) and the New Academic Word List (Browne, Culligan, & Phillips, 2013a). These lists have enhanced coverage compared to the original lists and have been developed from a larger data set that includes spoken English (Browne, 2014). However, the final version of these lists was published after the current project was completed and as a result our team was not aware of the lists until recently. Future studies should compare technical vocabulary to these newer lists.

One further limitation is the possible discrepancy between language used the actual clinical setting and that used in the lab. Most of the fundamental knowledge and skills are covered in lab classes and should be reflective of the fundamental vocabulary. However, future studies should aim to examine vocabulary used by staff nurses, preceptors and instructors in clinical settings.

Our results highlight the frequent use of technical vocabulary in clinical nursing instructions. The implication of these results for foreign language learners is that this technical nursing vocabulary should be considered for inclusion in pre-nursing language training. Further research should aim to identify a more complete corpus of technical language. Nursing education involves clinical practice, theory, and scholarship. In order to create a widely applicable technical word list, or a nursing-specific academic word list, it is necessary to include data from a wide range of nursing literature, including journal articles, textbooks, reliable websites, and course materials, as well as oral vocabulary used in the classroom and clinical settings. Further research is also recommended to examine the potential outcomes and most effective methods of incorporating the CNWL in pre-nursing coursework. For example,

does incorporating the CNWL in pre-nursing courses improve the listening comprehension and success of ELL students in clinical nursing courses?

Comparison of current results to previously developed healthcare-related words lists suggests that there may be differences between core medical and nursing terminology. It seems possible that discipline-specific terminology courses may be more effective than generic medical terminology courses that are sometimes offered to healthcare students. Such courses may miss important nursing-specific vocabulary and the time and resources spent on this vocabulary may be wasted learning words that are used with low frequency in the nursing profession. However, more research is needed to examine the apparent differences between medical and nursing terminology.

Conclusion

To our knowledge, this is the first study to develop a list of technical nursing vocabulary based on oral language use. Our results have highlighted the importance of verbal instruction as a source of data for the development of a nursing corpus, which has implications for the standardization of nursing language worldwide. The results demonstrate that nursing instructors use a high proportion of technical language when teaching core concepts to students. Although it is difficult to generalize results to other institutions, we hope that our study raises awareness about the potentially high proportion of technical language being used in nursing instruction. We recommend that supports be put in place to assist students studying nursing in a foreign language in dealing with the additional burden posed by unfamiliar technical language.

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Appendix 1. Top 100 word families in all classes combined

Root word	Count	Other terms included in word family
medication	557	medications, med, meds, medcarts, medicated
liter	284	liters, milliliters, mL, mLs
vein	273	venous, intravenous, IV, IVs
dose	259	doses, dosed, dosing, dosage, dosages
patient	242	patients
gram	235	mg, microgram, micrograms, mcg, kilo, kilos, kg
catheter	194	catheters, catheterization, catheterize,

		catheterizing
fluid	186	fluids
lab	180	labs
clinic	175	clinics, clinical, clinicals, clinician
interview	175	interviews, interviewed, interviewer, interviewing
sterile	175	steristrips, sterility, sterilized
drug	166	drugs, drugged
diagnose	160	diagnosed, diagnosis, diagnoses, diagnostic, diagnosticians
urine	156	urinate, urinating, urination, urinary, urinal, urinalysis,
math	148	maths, mathematician
diabetes	124	diabetic, diabetics
partum	110	antepartum, intrapartum, postpartum
kid	109	kids
exam	107	exams
surgery	101	surgeries, surgical, surgically, surgeon
pregnant	96	pregnancy, pregnancies
pediatric	91	pediatrics, peds, pediatrician, pediatricians
glove	87	gloves
session	87	sessions
epidural	86	epidurals
syringe	85	syringes
insulin	84	insulins
bladder	82	bladders
drain	79	drains, drained, draining, drainage, drainages
infect	79	infected, infection, infections, infectious
pill	72	pills
saline	71	
suture	71	sutures, sutured
infant	69	infants
dilute	68	diluent, dilutant, diluted, diluting, dilution
respiration	68	respirations, respiratory, respirate, resp, resps
flush	65	flushing
informant	61	informants
spine	61	spines, spinal, spinals
therapy	60	therapies, therapist, therapeutic
video	57	videos, videotape
windshield (survey)	56	
nasogastric	51	NG
pee	50	peeing
pulse	50	pulses, pulsing

vagina	50	vaginas, vaginal, vaginally, vaginosis
grab	49	grabbed, grabbing
allergy	48	allergies, allergic
blackboard	48	
muscle	48	muscles, muscular
summative	48	
client	47	clients
hyper*	47	
staple	47	stapled, stapler, staplers, staples
uterus	47	utero, uterine
stake	46	Stakeholder, stakeholders
vital	46	vitals
alcohol	45	alcoholic, alcoholism
contraction	45	contractions, contracture, contractures
formative	44	
fetus	43	fetuses, fetal
forceps	43	forceps
powerpoint	43	
buretrol	42	
cervix	42	cervixes, cervices, cervical
squeeze	42	squeezed, squeezing
hypo*	41	
oxytocin	41	
bedside	40	bedsides
diaper	40	diapers
mood	40	moods, moody
airway	39	airways
clamp	38	clamps, clamped, clamping
expire	38	expires, expired, expiry, expiration, expiratory
nerve	38	nerves, nervous, nervousness
symptom	38	symptoms
headache	37	headaches
hemorrhage	37	hemorrhages, hemorrhaging
oxygen	37	oxygenate, oxygenated, oxygenating, oxygenation, oximetry
physician	37	physicians
anesthesia	36	anesthesiologist, anesthetic, anesthetics, anesthetist, anesthetized
balloon	36	balloons
cope	36	coped, coping
kidney	36	kidneys
oral	36	
gauze	35	gauzes
tissue	35	tissues
vial	35	vials

abdomen	34	abdomens, abdominal
bubble	34	bubbles, bubblers, bubbling, bubbly
contraindicated	34	contraindication
obstetrics	34	obstetrical, obstetrician, obstetricians
absorb	33	absorbed, absorbent, absorbing, absorption
bowel	33	bowels
CC	33	
contaminate	33	contaminates, contaminated, contaminating, contamination
inject	33	injecting, injection, injections
nutrient	33	nutrients, nutrition, nutritional
thyroid	33	thyroidectomies, thyroxine

*Although hypo- and hyper- are not usually standalone words, they often act as such in nursing language. For example, a patient may say, "I'm feeling hypo", and a nurse should know how to respond. Hence, incidences of each of these prefixes were combined and included as word families.

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