

Building the Vanderbilt Integrated Teaching and Learning System (VITALS) and VITALS Spotlight Tool

VANDERBILT School *of* Medicine

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VITALS SPOTLIGHT FINDS AND HIGHLIGHTS REQUIRED CLINICAL EXPERIENCES (RCES) IN MEDICAL STUDENT ELECTRONIC HEALTH RECORD CLINICAL DOCUMENTATION USING STANDARDIZED TERMINOLOGY MAPPINGS FOR RCES AND AN EXISTING NATURAL LANGUAGE PROCESSING (NLP) SYSTEM. RCE DATA ARE MANUALLY ENTERED AND TRACKED IN VITALS, BUT FUTURE ENHANCEMENTS COULD IMPROVE RCE CONCEPT DETECTION AND USABILITY AS WELL AS INFORM FUTURE RESEARCH ON THE VALIDITY, UTILITY, AND GENERALIZABILITY OF RCE DEFINITIONS



INTRODUCTION

Healthcare education presents opportunities to valuably enhance students' educational tools and experience through clinical informatics. Previous studies have evaluated tools that track residents' clinical exposure to specific diagnosis categories through use of electronic health record data.¹ Similar studies of tools for tracking medical student experiences are needed. The Liaison Committee on Medical Education (LCME), the accrediting body for medical schools in the United States, requires students to track RCEs. By leveraging an existing NLP platform at Vanderbilt University Medical Center (VUMC), Word Cloud NLP, and VUSM's custom integrated learning platform, VSTAR, the authors built complementary tools for aggregating, capturing, and tracking RCEs at VUSM.

BASED ON STANDARDIZED TERMINOLOGIES.

Encounter Details	Learning Context
Encounter Date	Setting 😮
	Clinical Simulation Other
Associated Course	Patient Experience ?
Select the course in which you had this encounter. If the course is not listed, check the "This encounter is not associated with a course" box	Inpatient Outpatient
Select Academic Vear	Location
	Select Location
You are not enrolled in any courses that require a VITALS encounter to be submitted. You may still submit an encounter that will not be associated with a course.	Responsibility ?
This encounter is not associated with a course.	Observe Direct Supervision Indirect Supervision
Course or Volunteer Activity	
Encounter Type & Item Select the encounter type (Procedure, Skill, or Diagnosis) to display the list of items associated with the encounter type.	Patient Context
Select Type	
	Age
	Select Age
Encounter Comments	Special Population(s) (optional)
Optional space to record learning observations. No PHI (name, initials, date of birth, MRN) may be included.	Select Special Populations
BIUS IE E Normal = S	

METHODS

VUMC's Health Data Repository (HDR) is a vendorneutral repository of all VUMC clinical data collected since 1995. The HDR contains structured data, reports, images, and free-text documents for 4.5 million patients, including 1.3 billion documents. Word Cloud NLP processes each document using regular expressions, then excludes certain Unified Medical Language System (UMLS) terms, applies synonyms, and extracts concepts using a subset of ~12,000 UMLS concept unique identifiers (CUI), previously identified as the most clinically useful in the HDR.

VUSM clinical and educational faculty developed a list of 100 RCEs and associated data capture needs based on consensus educational requirements. RCE concept terms were created ad hoc as no standard terminology for medical education concepts exists; they include 61 diagnoses, 28 skills, and 11 procedures. Of the total, 29 RCEs were determined to be difficult to discretely detect in clinical documentation. The remaining 71 RCE concepts were manually mapped to the broadest UMLS CUIs and the most commonly occurring related CUIs, then refined by expert clinician review.

The Vanderbilt Integrated Teaching and Learning System (VITALS) allows easy data entry and comprehensive RCE tracking for students and faculty.

VITAL EXPERIENCES IN THE VANDERBILT INTEGRATED TEACHING AND LEARNING SYSTEM

Medical students manually record required clinical experiences.

Mon 06/20/2022	Chest Pain due to Coronary Artery	(- then 60YO M)
Family Planning	Disease	Medical Student Progress Note Created by:
Hypertension		Electronically signed by:
Menopause	2022/02/11	on
Normal Pregnancy	Medical Student Progress Note	
Vomiting	with crushing chest pain, was found to have a STEMI, and	-
Fri 06/17/2022	received a DES to the LAD	Attestation signed by MD at
Family Planning	Radiology : Echo showed EF 40-50% with "akinesis of the	Date of Service:
Sat 02/12/2022	mid to distal anterior septum and apex"; coronary angiogram showed 80-90% steposis of LAD before stept	Lreviewed the HPL PESH and ROS
Anxiety Disorder	placement and minimal other coronary disease with the	
Chest Pain due to Coronary Artery Disease	exception of 20% stenosis of proximal OM2	I examined the patient, and confirm the findings by the medical student below.
Congestive Heart Failure	Radiology : Echo showed EF 40-50% with "akinesis of the	
ECG Interpretation	mid to distal anterior septum and apex"; coronary	I have reviewed and discussed the chart, tests, labs, diagnoses, evaluation,
Hypertension	placement and minimal other coronary disease with the	and treatment plan with the medical student below. Corrections as noted in the
Laparoscopic Surgical Case	exception of 20% stenosis of proximal OM2	prinary and zhdary diagnosis
OBGYN Surgical Case (non-Cesarean Section)	Acute anterior stemi	Primary dx:
Vomiting	GDMT	Acute anterior stemi
Fri 02/11/2022	is a who presented to the hospital	s/p LAD PCI
Anxiety Disorder	with crushing chest pain, was found to have a STEMI, and received a DES to the LAD	DAPT
Chest Pain due to Coronary Artery Disease	ST-elevation myocardial infarction	GDMT
Congestive Heart Failure		2ndary dx:
Hypertension		2. OSA

VITALS SPOTLIGHT (DATE VIEW)

Required clinical experiences are organized by date and highlighted in medical student clinical documentation.

	Febrile Neonate	(then 2mo M)
Group by: Day Concept		Medical Student OP Visit Note 2021
Abnormal Movement 1	Medical Student Progress Note male who presented to the ED yesterday from an outside	Electronically signed by:

VITALS Spotlight is a proof-of-concept system that displays student clinical EHR documentation with highlighted RCE concepts. Future enhancements will expand RCE-mapped concepts to improve tool performance. Also, draft RCEs will be auto-built from VITALS Spotlight data to improve usability and RCE capture rates. Future research could compare the accuracy of computer aided RCE capture versus manual capture and evaluate the representation of RCEs in VUMC's patient population compared to expected exposures or future testing ratios. These data could eventually be used to augment future clinical rotations to support institutional educational goals or to personalize student experiences based on their interests or competency gaps. Lastly, RCE definition mappings could be validated and shared nationally to promote generalizability to other areas of healthcare education.

Abnormal Pregnancy and Loss 🕕 hospital with a fever _____ Abnormal Uterine Bleeding 😕 Attestation signed by [Acute Agitation 🕚 FOR EDUCATIONAL PURPOSES ONLY Medical Student OP Visit Note Acute Otitis Media 0 boy presenting with fever of unknown origin Acute Stroke/TIA 6 Jpon noticing this, they took his temperature rectally and I have reviewed the attached medical student note for educational purposes noticed a fever of 101.4 Altered Mental Status (9) only. Please see other encounter documentation for billing and clinical Constitutional : Positive for activity change and fever Anemia </u> 3 decision-making purposes. Anxiety Disorder (18) Chest Pain due to Coronary Artery Disease 🕖 Chronic Obstructive Pulmonary Disease 6 MONROE CARELL JR. CHILDREN'S HOSPITAL AT VANDERBILT Complicated UTI (Adult) 1 Congestive Heart Failure 10 Diabetes Mellitus 10 Diagnostic Throat Swab 🕧 _____ ECG Interpretation (4) Family Planning 6 This is a 2 m.o. boy presenting with fever of unknown origin. The parents Febrile Neonate (2) noticed today that he was unusually tired and lethargic this morning and not his Foley Catheter Insertion 2 usual playful self. Upon noticing this, they took his temperature rectally and Headache 🕧 noticed a fever of 101.4. Then, they took him to the Vanderbilt Peds ED. He has Heart murmur 2 had a mild rash over his whole body since birth; this does not appear to be Hypertension 27 prominent on examination.

VITALS SPOTLIGHT (CONCEPT VIEW)

Required clinical experiences are aggregated by concept. Students can view highlighted instances of the concept and the relenvant clinical documentation.

REFERENCES

¹ Rhee, David W. MD; Chun, Jonathan W. MD; Stern, David T. MD, PhD; Sartori, Daniel J. MD Experience and Education in Residency Training: Capturing the Resident Experience by Mapping Clinical Data, Academic Medicine: February 2022 - Volume 97 - Issue 2
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