



# Vanderbilt Clinical Informatics Center Education Strategy: To Infinity and Beyond!

Elise Russo<sup>1</sup> Allison McCoy<sup>1</sup> Dara Mize<sup>1</sup> Travis Osterman<sup>1</sup> Scott Nelson<sup>1</sup> Jonathan P. Wanderer<sup>2</sup>  
Adam Wright<sup>1</sup>

<sup>1</sup>Department of Biomedical Informatics, Vanderbilt University Medical Center, Nashville, Tennessee, United States

<sup>2</sup>Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, Tennessee, United States

**Address for correspondence** Adam Wright, PhD, Department of Biomedical Informatics Vanderbilt University Medical Center, 2525 West End, Nashville, TN 37203, United States (e-mail: adam.wright@vumc.org).

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## Abstract

**Background** The Vanderbilt Clinical Informatics Center (VCLIC) is based in the Department of Biomedical Informatics (DBMI) and operates across Vanderbilt University Medical Center (VUMC) and Vanderbilt University (VU) with a goal of enabling and supporting clinical informatics research and practice. VCLIC supports several types of applied clinical informatics teaching, including teaching of students in courses, professional education for staff and faculty throughout VUMC, and workshops and conferences that are open to the public.

**Objectives** In this paper, we provide a detailed accounting of our center and institution's methods of educating and training faculty, staff, students, and trainees from across the academic institution and health system on clinical informatics topics, including formal training programs and informal applied learning sessions.

**Methods** Through a host of informal learning events, such as workshops, seminars, conference-style events, bite-size instructive videos, and hackathons, as well as several formal education programs, such as the Clinical Informatics Graduate Course, Master's in Applied Clinical Informatics, Medical Student Integrated Science Course, Graduate Medical Education Elective, and Fellowship in Clinical Informatics, VCLIC, and VUMC provide opportunities for faculty, students, trainees, and even staff to engage with Clinical Informatics topics and learn related skills.

**Results** The described programs have trained hundreds of participants from across the academic and clinical enterprises. Of the VCLIC-held events, the majority of attendees indicated through surveys that they were satisfied, with the average satisfaction score being 4.63/5, and all events averaging a satisfaction score of greater than 4. Across the 20 events VCLIC has held, our largest audiences are DBMI, HealthIT operational staff, and students from the medical and nursing schools.

**Conclusion** VCLIC has created and delivered a successful suite of formal and informal educational events and programs to disseminate clinical informatics knowledge and skills to learners across the academic institution and health care system.

## Keywords

- ▶ medical informatics
- ▶ Graduate Medical Education
- ▶ medical students
- ▶ academic medical centers

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## Background and Significance

Academic institutions provide education in clinical informatics as part of degree programs, including those funded by the National Library of Medicine's Biomedical Informatics and Data Science Research Training Programs.<sup>1</sup> With the introduction of the Clinical Informatics Subspecialty Board Certification for physicians through the American Board of Preventive Medicine (ABPM) and American Board of Pathology (ABP) in 2010, fellowship programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) have been established to allow physicians to meet the eligibility criteria.<sup>2</sup> The American Medical Informatics Association (AMIA) 10 × 10 program was established in 2005 with a goal of educating 10,000 informaticians by 2010.<sup>3,4</sup> This program offers content from several degree programs covering both introductory and more specialized content in biomedical informatics. Finally, many vendors also offer trainings to employees of their customers. For example, Epic offers courses in conjunction with the University of Wisconsin–Madison Interprofessional Continuing Education Partnership on both general topics, such as Clinical Informatics, and topics specific to Epic software, such as Physician Builder. However, there are few accounts of an academic medical center's suite of informal and formal methods of training interested faculty, staff, trainees, and students on various clinical informatics topics.

In this paper, we provide a detailed accounting of our center and institution's methods of educating and training interested participants from across the academic institution and health system on clinical informatics topics, including formal training programs and informal applied learning sessions. We aim to provide tools and techniques for other institutions to start or bolster similar training and education programs for their constituents.

## The Setting

Vanderbilt University Medical Center (VUMC) has a large biomedical informatics department with several degree programs, including an MS in Applied Clinical Informatics (MS-ACI) and research-based MS and PhD programs. The department also plays a major role in applied clinical informatics work at VUMC. The Vanderbilt Clinical Informatics Center (VCLIC) is based in the Department of Biomedical Informatics (DBMI) and operates across VUMC and Vanderbilt University (VU) with a goal of enabling and supporting clinical informatics research and practice. VCLIC coordinates clinical informatics activities across VUMC and “paves the road” for clinical informatics researchers and practitioners, providing pathways and programs that enable faculty, students, and staff throughout Vanderbilt to find it easy to access data, test innovations, and evaluate results.

VCLIC supports several types of applied clinical informatics teaching, including teaching of students in courses, professional education for staff and faculty throughout VUMC, and workshops and conferences that are open to the public. One of VCLIC's goals is to provide outreach to

groups that may be interested in clinical informatics but not aware of what opportunities exist, including medical students, residents and fellows, faculty in clinical departments outside of DBMI, and operational HealthIT staff who may not have exposure to the academic aspects of informatics.

## The Solution

### Vanderbilt Clinical Informatics Center's Approach

Vanderbilt used a self-developed electronic health record (EHR) for several decades,<sup>5</sup> and processes for getting access to the system, getting access to data, and adding interventions were widely understood. After the transition to Epic in 2017, VUMC personnel were less certain how to engage with the new systems; pathways for accessing systems and data were not always documented or formalized. We created VCLIC as a community of clinical informatics practitioners, researchers, and learners. VCLIC's overarching goal is to make it easy for VUMC personnel to engage with the EHR, including accessing data, testing interventions, and evaluating outcomes. Our center manages Vanderbilt's Physician Builder and distributed data access programs, coordinates clinical informatics events, and offers various training programs. The training activities are the focus of this manuscript.

Each year, VCLIC chooses a theme around which to focus its educational and service activities. The theme is determined through a solicitation process via our center's Advisory Board and aligned with emerging topics in clinical informatics alongside VUMC's institutional priorities. VCLIC has had four themes, one for each academic year since our center's launch: “Making Health Care More Equitable through Technology;” “Innovative Care Delivery Models for Mental Health;” “Re-envisioning the EHR to Reduce Burnout and Improve Wellbeing;” and “Health System Efficiency through Clinical Informatics.”

In addition to the theme, after about a year of piloting various events, workshops, and seminars, we conducted an “educational needs assessment” to help us tailor our programming further, especially as it related to intended audience (→ **Supplementary Appendix S1**, available in online version). We interviewed eight individuals across the organization using a convenience sample, expanding it with a snowball method until we reached saturation. The individuals included 2 HealthIT leaders, one of whom also had a clinical appointment, 1 DBMI faculty member, 3 DBMI students, 1 DBMI trainee/alumnus, and 1 MS-ACI alumnus. We asked individuals what topics they or their peers would like to learn about; what effective learning/training experiences they've had; and, if they had been to some of our events/trainings, what had gone well and what hadn't. This process yielded a diverse array of information, and the synthesis was a bit open ended, as consensus on how best to teach or reach the varied audiences across VUMC was low. The biggest takeaway from the process was that we should try to target our events for different and specific audiences instead of attempting to reach everyone (students, trainees, clinicians, IT workers, etc.) all in the same session. In practice, this has proven difficult, as we advertise our events broadly

and don't turn away any potential attendees. We are currently working to develop new member management strategies that will allow us to better target offerings to specific groups of people.

## Activities

### Workshops

We have hosted a series of workshops since Fall of 2021 with topics ranging from where to find and how to use data resources at VUMC (→ [Supplementary Appendix S2](#), available in online version and → [Supplementary Appendix S3](#), available in online version), introduction to Epic for nonclinicians (→ [Supplementary Appendix](#), available in online version), FHIR app development (→ [Supplementary Appendix S5](#), available in online version), introduction to Tableau (→ [Supplementary Appendix S6](#), available in online version), using R for more involved data analysis, building BestPractice Advisories in Epic (→ [Supplementary Appendix S4](#), available in online version), and human-centered design principles (→ [Supplementary Appendix S7](#), available in online version). We planned and executed the sessions with the help of volunteer center members with expertise in each subject area. For each workshop, the designated instructor met with the center director and project manager 2 to 3 times in the 2 months prior to the session to plan the material and practice the delivery. When possible, we developed hands-on materials (e.g., worksheets, exercises using our Epic playground or other systems) to be used during the workshops.

The first year, the training sessions were 3 hours long, but in response to feedback from attendees that it was difficult to block that amount of time, and from instructors that it was difficult to plan and host the workshops, we condensed them to 90 minutes in subsequent years. In 2021 and 2022, we held a mixture of virtual and hybrid events using Zoom, as some staff were working remotely. In 2023, we transitioned the events to being fully in person, as we believed that would be the optimal learning environment for the material we were teaching. Although our attendance dropped precipitously (from a high of about 140 people in attendance on the Zoom to about 25 in person), we felt we were reaching a more engaged audience with in-person, hands-on learning events (during the remote trainings, few students would log into the activities or ask questions). In fact, after moving back to in-person events, engagement, participation, and follow-ups increased, even though raw attendance numbers fell.

Most events had a mix of DBMI faculty, staff, and students; HealthIT personnel; and clinicians from across clinical departments at the medical center. Following each event, we sent out short feedback surveys to assess session-specific details, as well as overall satisfaction and ways we could improve for the future.

### Vanderbilt Clinical Informatics Practical Short

We typically offered our workshops once a year, and individuals often sought to learn the topics at other intervals, for example, if they were new to Vanderbilt, had a new project

**Table 1** Currently Released Vanderbilt Clinical Informatics Center

- Overview of VCLIC and clinical informatics at VUMC
- Intro to Epic and build capabilities
- Data resources
- Human-centered design principles and processes
- Evaluation and dissemination of HealthIT interventions
- Exempt IRB research
- Address geocoding
- Using Epic to support clinical research
- Signal data
- Agile methods for leading a clinical or research informatics team
- Medication data tools
- Patient-reported outcome measures

Abbreviations: IRB, institutional review board; VCLIC, Vanderbilt Clinical Informatics Center; VUMC, Vanderbilt University Medical Center.

that required a new skill, had a conflict with the offering of the training, or recently became interested in a topic. We initially handled these ad hoc by, in many cases by meeting with the individual or sending written materials. To better meet these needs, we developed an asynchronous offering: VCLIPS, which are bite-size instructional videos on practical clinical informatics topics from expert VCLIC faculty and staff. They include many of the topics we previously covered in workshops, but instead of long, synchronous sessions, they are broken down into multiple 3- to 5-minute videos posted on our website. We distributed announcements about VCLIPS via email. To date we have had three "releases" of these video series, one each in Spring of 2023, Fall of 2023, and Spring of 2024. A complete list of video topics is shown in → [Table 1](#).

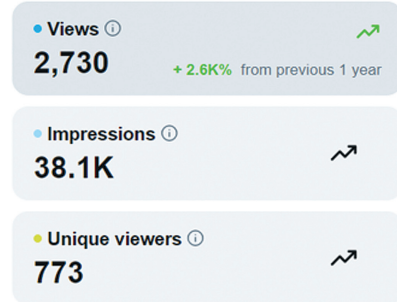
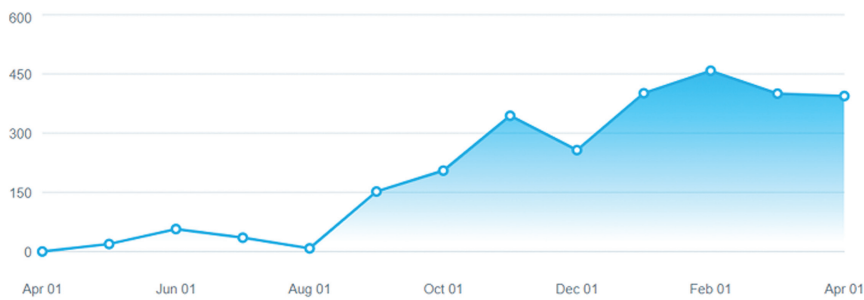
To produce the videos, we provided the instructors with as many sessions as necessary with the center director and project manager to develop an outline, create a hands-on activity, and break the material into short videos (→ [Supplementary Appendix S8](#), available in online version). We also provided screen capture and other video recording software where needed, although most used software they were already familiar with and had access to. Once the videos were recorded, posted the videos and written materials to the web.<sup>6</sup> → [Fig. 1](#) shows the number of views of VCLIPS over time.

### Special Events

Beyond the workshops and VCLIPS, our center has held several additional events to develop and engage our community's understanding of clinical informatics. In Spring 2021, we held a "Design Challenge": The VCLIC Techquity Design Challenge was an 8-week program that invited teams of students, clinicians, faculty, and staff from different scientific disciplines and of various backgrounds to propose novel solutions to problems related to health care equity and technology. Teams worked with each other and assigned mentors from our center to develop and record a prototype of their solution. The videos were judged by leaders from our health system and presented in our informatics seminar. This

## Overview &gt;

Apr 30 to Apr 29



**Fig. 1** Vanderbilt Clinical Informatics Center views, April 2023 to April 2024.

event engaged 45 participants from a range of disciplines and departments across the medical center; participating groups brought passion and tenacity as they sought to make VUMC a more equitable system and place. Although our focus was on design, many of the projects eventually ended up being implemented at VUMC after the end of the challenge (→ [Supplementary Appendix S9](#) available in online version).

In Spring of 2022, we held a hackathon in Vanderbilt's maker space, the Wond'ry. The Wond'ry is located at the crossroads of Vanderbilt's undergraduate and medical campuses, benefitting a goal of our hackathon to engage participants from the medical center and university. The event was based on our annual theme "technology to improve mental health care delivery." Participants included VU undergraduate students, VU medical students, other medical trainees, graduate students, and staff in the medical center. Over the course of about 30 hours spanning from early Friday afternoon to late Saturday afternoon, three teams worked together, assisted by VCLIC mentors, to develop prototypes. Teams presented wireframes of the planned applications to the audience and three senior judges from across the medical center and university. The judges deliberated on a set of criteria we developed to determine a winner (→ [Supplementary Appendix S10](#), available in online version).

In Fall of 2022 we held our inaugural InformaticCon event, resulting in our most successful effort at community engagement. InformaticCon is a local clinical informatics conference, where we solicit submissions from VUMC and VU faculty, staff, students, and trainees. After an informal review process, we selected speaker and poster presenters from the submissions. The presenters were provided with guidance on how to develop their presentations, whether oral or poster format, as not all of them had prior experience with academic presentation styles. The VCLIC team organized the on-campus event, providing boards for the poster session and audiovisual equipment for the speakers. The first year we hosted an hour of talks (8 seven-minute lightning talks in 1 hour) and then an hour-long poster session.<sup>7</sup> After the success of the first year, we held a second InformaticCon in Fall 2023, extending the event to 3 hours, with an hour-long poster session, a 45-minute panel discussion, "Getting Involved in Clinical informatics at Vanderbilt," during lunch,

and concluded with the hour of lightning talks.<sup>8</sup> We had approximately 75 attendees the first year and 120 attendees the second year (→ [Supplementary Appendix S11](#), available in online version).

### Speaker Series

In addition to our annual InformaticCon event, we invite speakers from all over the country throughout the year. DBMI hosts a weekly biomedical informatics speaker series, and as part of this series, we partner with DBMI to feature a clinical informatics-focused speaker approximately once a month. When possible, we also facilitate meals with the speaker, and meetings between the speaker and students, faculty, and staff in our center and DBMI. Where possible, we try to select speakers that will be broadly interesting and relevant to our annual theme.

### Clinical Informatics Graduate Course

In the Fall of 2022, we launched a new graduate-level course in clinical informatics (→ [Supplementary Appendix S12](#), available in online version). The course covers key topics in clinical informatics, including an overview of inpatient and outpatient EHR use, clinical decision support, terminologies, data resources, and HL7 and FHIR standards. To supplement the lectures, we invite experts on topics like nursing informatics, pharmacy informatics, leadership in clinical informatics, imaging informatics, and quality and safety related to informatics. As part of the course, we also organize field trips to various locations at VUMC, including an ambulatory clinic, intensive care unit, clinical lab, pharmacy, and data center. These visits allow students to witness the practical application of clinical informatics systems in real-world settings. Scheduled during the regular 90-minute class, the trips are coordinated with a knowledgeable host, often a VCLIC member, who provides a tour and answers student questions. Students are encouraged to reflect on the types of patients served (if any), the roles of the staff, and how technology is utilized in each area.

### Medical Student Integrated Science Course & Graduate Medical Education Elective

Advanced medical students at Vanderbilt are able to take a range of Integrated Science Course (ISC) courses. The Clinical

**Table 2** Analogous concepts for clinical education and treating the health care system as the patient

Clinical setting	Clinical informatics
Patient	Health care system
Clinic	Informatics “clinic”
Taking a history	Informatics H&P
Morning report	Interactive learning activities
Presenting on rounds	H&P review
Notes	Journals
Procedures	Projects

Abbreviation: H&P, History and Physical.

Informatics ISC is a 4-week elective offered twice-yearly to third- and fourth-year medical students.<sup>9</sup> The course was developed in 2020 and first piloted in May 2021 by VCLIC members who are also senior operational and educational leaders. The course is delivered through learning modalities analogous to what learners would experience during a traditional clinical rotation, as shown in **Table 2**. In this course, learners treat the health care system as their patient and look for opportunities to employ informatics tools to address the organization’s needs. *Informatics Clinic* offers students an observational experience to learn from clinical informaticists during their daily practice. *Informatics History and Physical* requires students to apply the same tools used when caring for a patient to a challenge identified during workflow observation in various clinical settings. They then present their work during a weekly *H&P Review* presentation attended by course directors, leaders from the clinical area of observation, and other students. Some of the student presentations are chosen for implementation. During *Interactive Learning Activities*, learners put into practice new skills while working through real-world cases with oversight by practicing clinical informaticists. Each week, students synthesize and summarize what they have learned from one aspect of the course in a required journal activity. Weekly projects are also assigned to get students hands-on experience learning to use a particular informatics tool or resource.

The VUMC Clinical Informatics Elective for Graduate Medical Education (GME) grew organically from individual learner requests to do “rotations” in the DBMI.<sup>9</sup> These experiences ranged from research requests to broad survey-styled rotations. To help standardize the clinical informatics experience, we formed a common entry point to allow learners to apply for a rotation and to ensure support from the learner’s primary program director. This rotation was officially launched with support from the Office of GME in 2019.<sup>9</sup>

Initially, the GME rotation focused on the 1-on-1 pairing of GME learners with clinical informatics faculty. The rotation provided an outline for both the learner and faculty member and ensured core exposure to fundamental areas of informatics. Based on feedback from incorporating GME learners into the evolving undergraduate medical education

(UME) ISC course for undergraduate medical students, the GME rotation began to leverage the core content developed for medical students. Specifically, residents and fellows appreciated the didactic and group activities created for the medical student curriculum. As of 2022, the GME rotation is largely unified with the UME course, and learners are together through all sessions.<sup>9</sup> GME learners have the option of either a 2- or 4-week rotation. These blocks must align with the course offering for the UME learners.

### Clinical Informatics Fellowship

The VUMC Fellowship Program in Clinical Informatics is a 2-year, ACGME-accredited fellowship with both didactic and rotational training experience. All fellows are strongly encouraged to also continue clinical practice in their primary specialty. VUMC Clinical Informatics fellows also complete the VUMC Master of Science in Applied Clinical Informatics (MS-ACI) for foundational knowledge to support the daily practice component of the fellowship rotation experiences. VUMC Clinical Informatics Fellowship graduates are well suited for various roles after graduation. Graduates of this program have accepted roles in operational leadership, research, and industry. After completing the program, clinical informatics fellows are eligible to sit for and prepared to pass the board certification examination for the subspecialty in clinical informatics.

### Master of Science in Applied Clinical Informatics Program

In 2016, VUMC launched the MS-ACI, with the first graduating class in 2018. The MS-ACI program is a fully online program, which offers comprehensive informatics training for working health professionals. Over 21 months, students complete 36 credits of clinical informatics coursework, gaining practical insights and hands-on experience. The program emphasizes real-world application through a mentored capstone project, and the digital format of the MS-ACI program accommodates distance learning for busy health care professionals. The curriculum is based on AMIA’s core competencies and foundational domain,<sup>10</sup> and the AMIA delineation of practice.<sup>11</sup> The curriculum prepares physician participants for Board Certification in the Subspecialty of Clinical Informatics offered by the ABPM and the ABP. Nonphysician participants are prepared for the AMIA Health Informatics Certification offered by the AMIA Health Informatics Certification Commission. So far, 36 students have completed the MS-ACI degree program,<sup>12</sup> several of whom are now in Chief Medical Informatics or Information Officer positions across the globe.

### Support for Epic Certification and Training

VUMC has the largest Epic Physician Builder program, per capita, with 91 builders across 22 departments. The program was founded by an anesthesiologist and clinical informatician who is a VCLIC member and is coordinated by our center. While most members are physicians, our program also includes nurses, pharmacists, and PhD informaticians, and thus is scoped more broadly than Epic’s official Physician Builder training track. Participants complete EHR build training offered by Epic and, after completing a certification,

are given access to build in our EHR. Crucially, clinical departments are required to give participants protected nonclinical time to participate in the program, and our Physician Builders both initiate projects and complete the build themselves, often supporting efforts led by our HealthIT department. Builders at VUMC have broad access to build in many different functional areas of Epic and are paired with an “analyst buddy” in our HealthIT department. In addition to coordinating the program, our center also gives an annual award to outstanding Physician Builders.

In parallel with the Physician Builder program, VCLIC also initiated and operates the Vanderbilt Database Access Working Group (VDAWGs) program, which is a pathway for obtaining access to VUMC clinical data warehouses, including Epic Clarity and Caboodle. The program currently has 22 participants. These participants complete Epic training and are given access to the relevant warehouses with approval from their department chair, institutional review board review, and regular audits. Participants are asked to predeclare the scope of their work, and audits ensure that participants are accessing data appropriate for their score. As needs evolve, participants are able to update their scope.

### Clinical Informatics Knowledge Base

Our center developed a wiki-style knowledge repository that houses how-to articles on a variety of topics, including how

to obtain Epic training (with a focus on Physician Builders and Clarity Database access), how to get access to VUMC's data resources, and how to evaluate and disseminate clinical informatics projects. Anyone at VUMC can search for, read, create, and edit articles in the knowledge base, but the majority have been written by center members. The knowledge base also hosts our VCLIPS videos and associated text as well as our Clickbusters program,<sup>13</sup> a step-by-step process for improving CDS at VUMC.

### Analysis

We surveyed participants on their satisfaction (and regarding how they would improve the experience) following 20 VCLIC events and aggregated the responses, as shown below.

→ **Table 3** shows feedback from our center's events. The first eight workshop events we held were either fully virtual or hybrid, and thus garnered a larger audience (39–137 attendees). We then switched to fully in-person events, which resulted in lower attendance (16–41 participants) but greater engagement. The FHIR Workshop in March 2023 was an all-day event and advertised more broadly. InformaticCon conferences garnered greater attendance. Some of our one-off events (the Design Challenge and the Hackathon) were smaller scale. On average, around 20% of attendees provided feedback on our events. For most events, we asked

**Table 3** Number of attendees, number of feedback responses, and satisfaction scores from attendees of Vanderbilt Clinical Informatics Center events between 2021 and 2023

Date	Event	Approx. no. attendees	No. of feedback responses	% feedback responses	Satisfaction
February 2021	Disparities data lab	137	30	21.9	4.57
March 2021	FHIR app building workshop	126	23	18.3	4.26
Spring 2021	Design challenge	47	12	25.5	4.40
April 2021	Tableau workshop	131	21	16.0	4.67
September 2021	Intro to eStar	89	22	24.7	4.41
October 2021	Data resources and analytics	59	8	13.6	4.88
November 2021	Intermediate analysis	39	5	12.8	4.20
January 2022	Design principles in app development	81	8	9.8	4.75
February 2022	FHIR app building workshop	82	4	4.9	4.25
February 2022	Mental Health hackathon	38	20	52.6	4.45
September 2022	InformaticCon	119	35	29.4	4.97
February 2023	Intro to Epic and build capabilities	41	8	19.5	4.75
March 2023	FHIR workshop	64	9	14.1	4.10
March 2023	Data resources	22	7	31.8	4.86
April 2023	Human-centered design principles	22	2	9.1	5.00
May 2023	Evaluation and dissemination	16	3	18.8	5.00
September 2023	InformaticCon	127	44	34.6	4.93
September 2023	Intro to Epic for nonclinicians	36	13	31.1	4.46
October 2023	Intro to Epic build capabilities	29	8	27.6	5.00
April 2025	Patient-reported outcome measures	32	4	12.5	4.75
Average		66.9	14.3	21.7	4.63

specific feedback questions, but we always included one question asking attendees to rate satisfaction on a scale of 1 to 5 (5 being the highest). The majority of attendees were satisfied with our events, with the average satisfaction score being 4.63/5, and all events averaging a satisfaction score of greater than 4. The response rate for our evaluation surveys was fairly low, which may limit the generalizability of our findings. In general, we found the specific comments to be the most valuable part of the surveys.

We have trained 100s of VUMC and VU faculty, staff, trainees, and students. The most prevalent group of trainees is from DBMI, but we have had numerous trainees across our clinical departments and divisions (e.g., General Internal Medicine, Pediatrics, Anesthesiology, Emergency Medicine, ENT, OB/Gyn, Genetic Medicine, GI, Urology, Psychiatry, Radiation Oncology, Pharmacy), health policy, staff from our HealthIT operational group, many medical and nursing students, residents and VU School of Medicine students, students and faculty from the Nursing School, and faculty and participants from VU-based departments, including Computer Science, Biomedical Engineering, Electronics and Communication Engineering, and Anthropology.

## Summary of Successes and Challenges

Over the last four years, VCLIC's educational programs have reached students, faculty, staff, and other types of trainees across Vanderbilt. These programs have been well received, and in the future, we plan to collect more comprehensive data on the outcomes of our educational programs. VCLIC's members and program attendees are diverse, including practicing physicians, nurses, and pharmacists as well as experienced informaticians and new learners. Not all topics are relevant to all learners (e.g., "introduction to Epic" may be too basic for a practicing clinician), so we found it important to conceptualize the expected learner(s) when designing offerings and then to communicate the expected audience in marketing materials. We will continue to improve our offerings and innovate in both formal and informal educational programs.

## Lessons Learned

Moving forward, we plan to continue many of our most successful initiatives, including InformaticCon, VCLIPS, our informatics course, and our degree and training programs for informatics learners, medical students, and house staff. We also hope to create a longitudinal training program for residents, similar to the Wake Forest clinical scholars in informatics<sup>14</sup> and we are in the process of creating additional pathways for medical students to get more hands-on informatics experience.<sup>15</sup> Finally, we are planning to create an internship program for DBMI students and other Vanderbilt learners interested in gaining practical experience in VUMC's HealthIT department and other local employers (other health systems, technology vendors, consulting firms, and startups).

Please note, these activities were conducted as part of the faculty's ongoing teaching activities without additional compensation. The events had some direct costs for room rentals and food, but they were small. The center operations director assists with many of these activities, spending about 20% of her time funded by Vanderbilt to work on them.

## Recommendations

We believe that other organizations, particularly informatics programs and academic medical centers, could offer similar programs based on the information provided in this manuscript and appendices. Our education programs have been a key contributor to Vanderbilt's uniquely vibrant clinical informatics culture, and we have found that many people who do not initially identify as clinical informaticians enjoy the training and find sufficient inspiration to gain further training and, in many cases, change the direction of their research and career.

The VCLIC, in conjunction with VUMC, has created and offered a broad portfolio of educational activities to a wide range of learners. This has led to widespread improvement in clinical informatics skills and knowledge at Vanderbilt. The program could be replicated at other institutions.

## Clinical Relevance Statement

VCLIC's clinical informatics educational offerings provide practical knowledge that allows a wide range of learners to improve clinical care. Further, these training programs provide pathways for learners to become more involved in clinical informatics, including becoming clinical and operational leaders of health systems in clinical informatics-focused roles, such as Chief Medical Information Officer. The skills and access the Physician Builder and VDAWGs programs provide clinicians and informaticians have allowed them to carry out clinically impactful quality improvement and research projects.

## Multiple-Choice Questions

1. What is one of the primary goals of the Vanderbilt Clinical Informatics Center (VCLIC)?
  - a. To exclusively offer online courses
  - b. To provide clinical informatics education across various platforms and settings
  - c. To limit educational outreach to medical students only
  - d. To focus solely on research without educational components

**Correct Answer:** The correct answer is option b. VCLIC's goal is to provide education wherever learners will benefit from it, and provides learnings across various platforms and setting.
2. Which of the following is not listed as a method used by VCLIC to deliver clinical informatics education?
  - a. Long-form instructional videos

- b. Workshops and seminars
- c. Graduate-level courses
- d. Fellowship programs in clinical informatics

**Correct Answer:** The correct answer is option a. VCLIC has focused on short videos, which learners can benefit from quickly.

3. What theme did the VCLIC choose for one of their educational and service activities to focus on during an academic year?
- a. Advanced data analysis techniques
  - b. Making health care more equitable through technology
  - c. Next-generation pharmaceutical informatics
  - d. Enhancing surgical precision through informatics

**Correct Answer:** The correct answer is option b. In its first year, VCLIC chose “Making health care more equitable through technology” as its theme.

#### Protection of Human and Animal Subjects

There was no human subjects research approval required for any data collection related to this manuscript. Data were collected for quality improvement reasons only.

#### Funding

None.

#### Conflict of Interest

None declared.

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