

# The Virtual Cardiology Rotation: Situating Cognition and the Signature Pedagogy in Medicine



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## ABSTRACT

**Background:** Corona Virus 2019 (COVID-19) challenged the delivery of medical education and training, especially to the 4th year medical students. Medicine's signature pedagogy, the ward rounds in the hospital, was put on hold in compliance with safety precautions during this pandemic and the Commission on Higher Education's (CHED) suspension of face-to-face classes in all levels. How the University of Santo Tomas Faculty of Medicine & Surgery (UST-FMS) Cardiology Rotation was delivered despite these restrictions is described.

Using Google Classroom, Blackboard Collaborate, and Zoom, a 7-day online Cardiology Clerkship rotation was delivered to UST-FMS 4<sup>th</sup> year students (clerks) using the synchronous and asynchronous mode of delivery. It consisted of the following: 1) Cardiovascular (CV) Ward Rotation with 3 cases using Google Classroom's adaptive release to create a vicarious experience of taking care of a patient and doing all the tasks that a clerk is supposed to do; 2) Virtual Ward Rounds by a consultant; 3) Outpatient Department (OPD) / Ambulatory Care Services (ACS) case discussions with a consultant and a 4) Heart Station Rotation for training in electrocardiogram (ECG) interpretation.

**Conclusion:** The advances in technology and software provided just-in-time resources that made

possible the creative delivery of Medicine's signature pedagogy.

**Key words:** virtual cardiology rotation, clerkship, signature pedagogy

## INTRODUCTION

Signature pedagogy was defined by Shulman (2005) as "the types of teaching that organize the fundamental ways in which future practitioners are educated for their new professions," where students are taught the "fundamental dimension of professional work - to think, to perform and to act with integrity." For medical schools, bedside teaching and clinical rounds in the hospital are the signature pedagogy [1].

In March 2020, when the World Health Organization declared the COVID-19 pandemic, a cascade of events ensued that challenged the delivery of the signature pedagogy, especially to the 4th year medical students the clerks. The COVID-19 pandemic, with all its face-to-face restrictions by the Commission on Higher Education (CHED) and the mandated social distancing by the Department of Health, challenged Medicine's clerkship training program in all its three dimensions as defined by Shulman, the surface structure, the deep structure, and the implicit structure. The surface structure of Medicine's pedagogy is the hospital which makes learning possible with its clinical triad - the patient, the physician-teacher (the interns, the residents, and the consultants), and the medical clerk. Its deep structure is the assumption that the patient is the best teacher that develops the clerk's clinical

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eye, his history-taking acumen, and the invaluable experience of witnessing the actual clinical course of a disease and how it is altered by the management. This learning is reinforced by the physician teachers' ward rounds grounded on the principle of situated cognition. The implicit structure is the actual patient encounter that develops not only his clinical competence but also hones his professional attitudes and values, develops his compassion and empathy, and provides the practical application of ethical standards guided by the physicians in the team.

The literature described the myriad strategies medical schools worldwide employed to compensate for the restrictions imposed by COVID-19 [2, 3] and still deliver some semblance of the signature pedagogy [4, 5]. For clinical clerkship, the challenge was how to simulate the learnings the hospital, the patient, and the physician-teachers provide.

At the beginning of the Academic Year 2020-2021, the UST-FMS clinical clerkship programs, embarked on two basic types of rotations - virtual or online distance learning in the first half of the year and face-to-face hospital rotation in the second half of the year with the premise that the pandemic will be manageable if not put to an end in the last half of the school year. There were high hopes that the vaccines would work. A class of clerks consisting of about 120 students was given a 1-month Internal Medicine (IM) rotation, of which seven days were for the Cardio-Pulmo Module (Table 1). The section designed and implemented a Virtual Cardiology Rotation closely approximating a real clerkship hospital experience. This article aims 1) to describe the virtual Cardiology Ward Rotation grounded on the principles of situated cognition that simulates all the activities in a clinical cardiovascular clerkship rotation; 2) to demonstrate the use of google classroom in the delivery of a simulated daily patient

encounter from initial presentation to discharge; 3) to show how bedside rounds can be conducted using anchored instruction from the simulated case scenarios; 4) to describe the OPD case exposures, and 5) to describe the simulated Heart Station rotation experience.

### The Cardiology Rotation in a Nutshell

The virtual Cardiology rotation, in general, was divided into asynchronous and synchronous activities (Table 2). The asynchronous activities included the Cardiovascular Ward Activities, the Heart Station, and the skills videos. The synchronous activities were conducted initially via Blackboard Collaborate and then via Zoom when it became available. They were conducted by cardiologists who were loaded to teach Cardiology. These were the OPD case presentations and the Meet the Expert (Ward Rounds) of the consultants. General orientation on what to expect in the rotation and their group assignments were given on day one. The orientation introduced them to the Cardiovascular Rotation, the teaching-learning activities, and the contents and use of the google classroom, including instructions on how to write chart orders, progress notes, and discharge summaries.

### The Cardiovascular Ward

The virtual cardiovascular ward was created to simulate an in-patient hospital exposure. Grounded on situated cognition, anchored instruction, cognitive apprenticeship, limited peripheral participation, and reciprocal teaching, it was designed to meet the UST-FMS Institutional Learning Outcome (ILO) of "Competent Professional with Ethical Practice, Critical Thinker and Life-long Learner." Figure 1

**Table 1.** First Loop Rotation Schedule of class of clerks from UST-FMS given a 1-month IM rotation

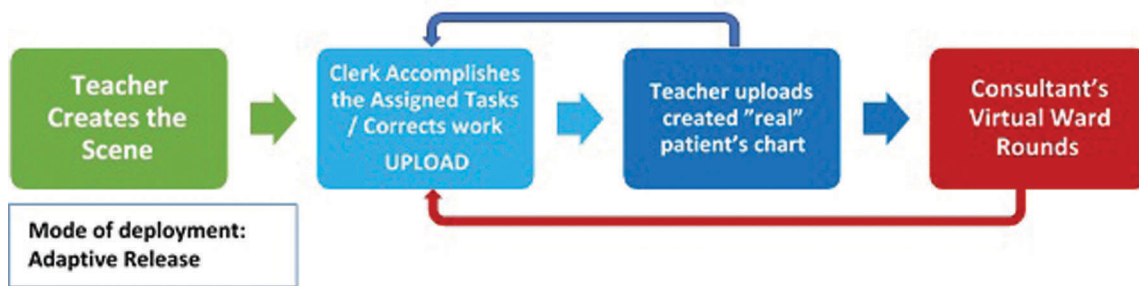
Rotation Schedule	Week 1	Week 2	Week 3	Week 4
Group 1	CARDIO-PULMO ER-ACS*	IT- RHEUMA ER-ACS*	GI-HEMA-ONCO ER-ACS*	ENDO-NEPHRO ER-ACS*
Group 2	ENDO-NEPHRO ER-ACS*	CARDIO-PULMO ER-ACS*	IT- RHEUMA ER-ACS*	GI-HEMA-ONCO ER-ACS*
Group 3	GI-HEMA-ONCO ER-ACS*	ENDO-NEPHRO ER-ACS*	CARDIO-PULMO ER-ACS*	IT- RHEUMA ER-ACS*
Group 4	IT- RHEUMA ER-ACS*	GI-HEMA-ONCO ER-ACS*	ENDO-NEPHRO ER-ACS*	CARDIO-PULMO ER-ACS*

\*ER-ACS: Emergency Room – Ambulatory Care Services

**Table 2.** Teaching-Learning Activities in the CV Rotation among UST-FMS class of clerks.

	Day 1	2	3	4	5	6	7
<b>Asynchronous</b>							
Cardiovascular Ward	Orientation						
Heart Station	Watch video						
Skills Videos							
<b>Synchronous</b>							
Meet the Expert							
OPD Conference							

Schedule of synchronous activity may vary depending on the day of the week the consultant is loaded.



**Fig. 1.** Teaching Learning Process in the Cardiovascular Ward of the University of Santo Tomas Hospital (USTH).

depicts the teaching-learning process model in the virtual Cardiovascular ward rotation.

A group of 30 students was divided into groups of 3 members each. This was to facilitate peer-group learning and collaborative work. Each group was given 3 cases to work on, but only one was assigned to upload the required written work daily, the case's Clerk-In-Charge (CIC). All of them were a CIC of a case.

The Google Classroom's assignment tab with the adaptive release was used to deliver the case scenarios, forms, and the results of laboratory and ancillary procedures to the clerks in a timed release at 8 am every day. Table 3 shows a daily plan of tasks for the teacher and the CIC. It details the cases, disclosures, and attachments that the teacher must create and the required submissions from the students. As a section rotates in 4 batches, four sets of 3 different cases were prepared (Fig.2). Deployment on successive days was chosen to give time for the subgroups to discuss the case. Case 1 was deployed on day 2, case 2 on day 3, and case 3 on day 4. All the cases end on day 7, the last day of the rotation.

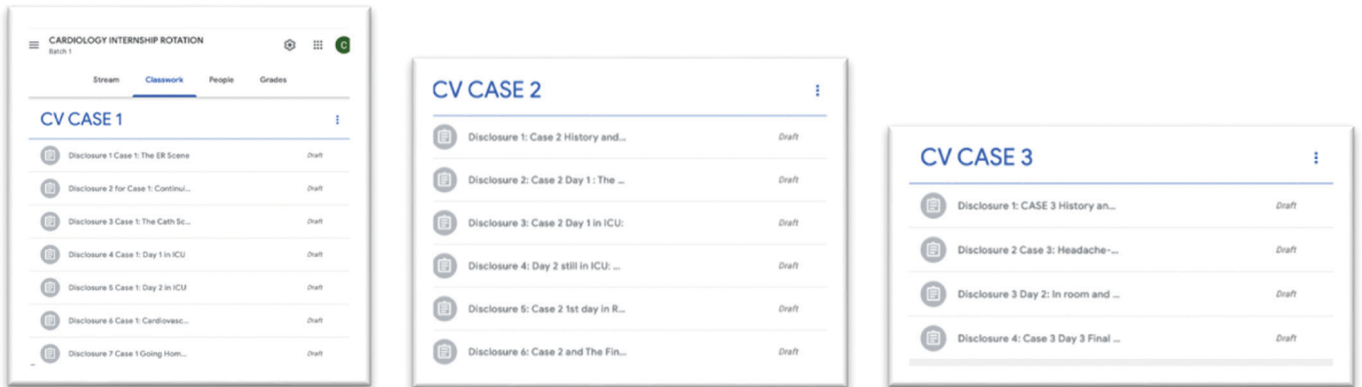
The activities that the CIC needed to accomplish for the first day of the cases were Subjective and Objective Salient Features (1st submission only),

Problem List, Admitting Orders, and Day 1 Progress Notes, and for the successive days - updated Problem List, Physician Order Sheet, Daily Progress Notes and on the patient's discharge - the Discharge Summary, Instructions, and Take-Home Medications and Prescription. Fig. 3 shows the different forms provided to them.

The accomplishment of different forms was designed to achieve specific learning objectives. Salient Features was training in determining important subjective and objective data to help generate the problem list and arrive at a rational working diagnosis. The Problem List aimed to develop critical thinking in determining the problems that must be addressed and, depending on the patient's course, which was resolved or needed continuing management on discharge. The Order Sheet forced them to return to their books, read journals and treatment guidelines and finally write their chart orders. These are the things that they will do as physicians. The advantage of the virtual platform is the freedom to order without the fear of "having a license to lose." This is a task that they cannot freely do in an actual patient's chart. The daily Progress Notes (Subjective – Objective – Assessment – Plan: SOAP) reinforced the training afforded by the Order

**Table 3.** Design of a Ward Case in Google Classroom

DAY	TEACHER'S TASK: CREATE	TEACHER'S TASK: ATTACH	CIC'S TASK: SUBMIT
1	ER Scene (History and PE), Welcome Note and Instructions	Forms, Cardiac Monitor, ECG, All Forms	
2	ICU Scene, Course, and Instructions	Filled Salient Features, Problem List, Physician Order Sheet: ER and Admitting Orders, Laboratory and Ancillary Results	Salient Features, Problem List, Physician Order Sheet: ER and Admitting Orders, Progress Notes
3	Ward Scene	Updated Problem List, Physician Order Sheet, Laboratory and Ancillary Results	Updated Problem List, Physician Order Sheet, Progress Notes
4	Ward Scene	Updated Problem List, Physician Order Sheet, Laboratory and Ancillary Results	Updated Problem List, Physician Order Sheet, Progress Notes
5	Ward Scene	Updated Problem List, Physician Order Sheet, Laboratory and Ancillary Results	Updated Problem List, Physician Order Sheet, Progress Notes
6	Ward Scene	Updated Problem List, Physician Order Sheets	Updated Problem List, Physician Order Sheet, Progress Notes
7	DISCHARGE	Physician Order Sheet	Discharge Summary and Instructions, Take Home Medications List and Prescriptions



**Fig. 2.** The CV Cases for adaptive release in Google Classroom.



**Fig. 3.** The forms to be accomplished.

Sheet as they learned to think like a physician. The S (subjective) is a lesson in listening to patient’s complaints as they make the virtual rounds with

the consultant. These were described in the daily disclosure and placed as side notes in the physician’s order sheet. The O (objective) forced them to identify

**Table 4.** The Heart Station tasks in USTH

DAY	TEACHER'S TASK: CREATE	TEACHER'S TASK: UPLOAD	CIC'S TASK: SUBMIT
1	Set 1 ECG tracings (5)	Upload review files and videos on ECG interpretation, learn and play ECG rhythms and Introducing the Heart Station	Review the learning materials
2	Set 2 ECG tracings (5)	Upload Set 1 tracings	
3	Set 3 ECG tracings (5)	Upload Set 2 tracings Upload Set 1 tracings with interpretation	Submit set 1 tracings
4	Set 4 ECG tracings (5)	Upload Set 3 tracings Upload Set 2 tracings with interpretation	Submit corrected set 1 tracings and set 2 tracings
5	Set 5 ECG tracings (5)	Upload Set 4 tracings Upload Set 3 tracings with interpretation	Submit corrected set 2 tracings and set 4 tracings
6		Upload Set 5 tracings Upload Set 4 tracings with interpretation	Submit corrected set 3 tracings and set 4 tracings
7		Upload Set 5 tracings with interpretation	Submit corrected set 4 tracings and set 5 tracings
8			Submit corrected set 5 tracings

the critical daily physical examination data and interpret the attached laboratory and ancillary procedures. The A (assessment) taught them to discern whether, based on the objective data, the patient is improving, in status quo, or deteriorating. The P (plan) was training in choosing the diagnostic procedures appropriate for their differentials or the day's clinical presentation. This was a practice of the mental ESSC considerations (efficacy, safety, suitability, and cost) they learned in Pharmacology. Whatever they write in their plan must be reflected in their orders.

Daily adaptive-release feedback was provided after they had uploaded their work. These were the filled salient features, problem list, and orders written by the consultant or resident. This simulated the experience of being able to read the patient's actual chart. They were instructed to correct their work using red fonts, but the initial work must not be deleted. The daily orders and progress notes were added each day successively. (See Fig. 3)

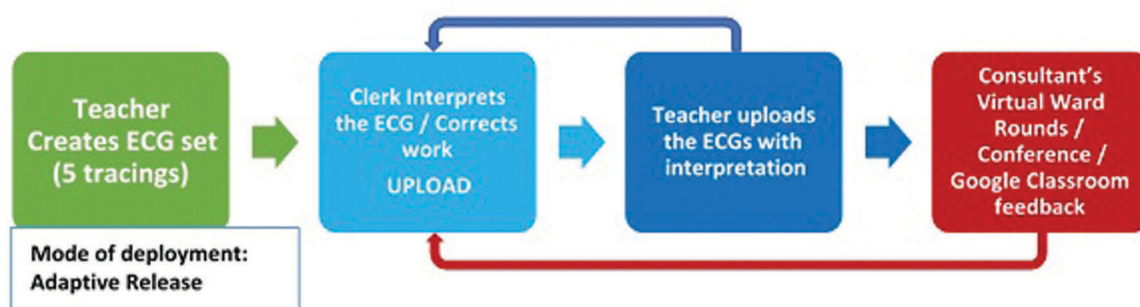
### The Daily Ward Rounds

To simulate the ward rounds, a consultant teacher conducted Zoom meetings anchored on the deployed cases. In these meetings, the teacher and the students exchanged viewpoints regarding the case and its management. This was also the venue where the consultant gave feedback on the submitted works, from the salient features to the progress notes.

### The Heart Station

The clerks' skill in electrocardiogram (ECG) interpretation was honed here. Pre-pandemic, clerks went to the Heart Station every afternoon to read the ECGs. They were mentored by the resident and the rotating cardiovascular fellow. To simulate this, the virtual Heart Station was created. To prepare them for this rotation, day 1 reviewed ECG and rhythm interpretation in a game format available on the internet.

Five ECGs were sent to them for five days in a timed-release manner every 8 am. They had to identify the rhythm, measure the rate, PR interval, QRS duration, and QT actual, and interpret the ECG. The tracings with interpretation were sent to them the following day, along with the new tracings for interpretation. To facilitate learning, they had to correct and score their work. Their corrected ECGs were submitted the following day, along with the ECG interpretations due for submission for the day (Table 4). The tracings with interpretation simulated the experience of seeing the consultant's ECG interpretation the following Heart Station Day. Making them correct their work reinforced learning as they saw their mistakes and learned from them. As they went through this daily task, they commented that there was ease in the interpretation, and their scores improved each day. Any difficulty in the interpretations was discussed in the Zoom ward rounds. Questions on the interpretation were also sent to the Google classroom, where feedback



**Fig. 4.** Teaching Learning process in the Heart Station of USTH

was given by the consultants. Fig. 4 summarizes the teaching-learning process in the Heart Station.

### The Outpatient (OPD) Case Presentations

To provide holistic exposure, OPD case conferences were included in the rotation. Instead of the pre-pandemic rotation in the Cardiovascular Ambulatory Care Services rotation (ACS), they were exposed to patients with cardiovascular complaints or having their follow-ups following discharge via two Zoom meetings dedicated to the OPD cases sent to them earlier. The common OPD presentations discussed were chest pain, palpitation, dyspnea, other heart failure symptoms, and hypertension. Discussions centered on differentials, diagnosis, work-up, and treatment.

### The Skills Video

A Skills Video Station was provided in the Google Classroom for asynchronous viewing. It contained videos on heart sounds and murmurs, cardioversion, radial artery cannulation, coronary angiography and stenting, transthoracic Echo, and how to place the venous catheter.

### Students Formative and Summative Assessment

The People tab in Google Classroom provided a centralized depository of the assigned submissions. Professors could see all their submitted work, with notations on whether they were submitted on time or not. The chronological format allowed tracking of their progress as they went through their daily activities. It also provided a section where teachers could comment on their work. At the end of the rotation, they were asked to do a self-evaluation,

using the rubrics provided on how they will be graded in the rotation: 50% ward performance, 30% Heart Station, 10% Conference Performance, and 10% Peer Evaluation. The rubrics were available in Google Classroom. They were also asked to write a reflection on their experience in the Cardiology Rotation. Here are some of the touching comments: "The module was very high yield"; "... the activities we were assigned seemed at first overwhelming but were very insightful and taught me so much about data interpretation and patient management": "... Nobody will disagree with me that CV rotation is one big rollercoaster ride. From the very start, this rotation knows no chill at all. We are simply bombarded with loads and loads of tasks. Despite all these, CV rotation is my favorite IM rotation. This is the only rotation that made me feel what it is like to be a clerk!" "CV Rotation successfully imparted knowledge, discipline, and, more importantly, good camaraderie." "Kudos to the CV rotation for imparting such a wonderful program." "I was pushed beyond my limits as I was able to encounter a lot of new journals." "This rotation has made me so excited and really looking forward to the actual rotation."

### The COVID-19 Challenge

This simulated Cardiology Rotation was a lesson in resilience. The pandemic did not hinder us from making the clerks learn the way we did, the way the clerks and interns before them learned how to become a physician imbued with the Thomasian attributes of a servant leader, an effective communicator, and a collaborator, an analytical and creative thinker, and a lifelong learner. They learned to go back to their notes and books and to search the internet for Guidelines to write that one order that will make a difference in their patient's life. More importantly,

they experienced a collaborative peer-learning environment. As one clerk said, "I never realized how working in a group made a lot of things easier."

### Implications for Future Research

Analysis of the submitted works provides a rich source of information and data for future medical education research, either qualitative or quantitative. The reflections they wrote could be qualitative research on lived experience, while the graded ECG interpretations could provide objective data on how to teach such technical skills. Their chart orders at the end of the rotation provide a picture of their progress in this skill, which can also be a subject of future research in pedagogy. Insights on improving the delivery of clerkship training, even post-pandemic, can also be gleaned.

### Acknowledgment

Special thanks to Dr. Manuel Zacarias, who invited me to join the Clerkship Committee, Dr. Lerrie Gutierrez, who made the daily ward rounds, Dr. Wilson Tan de Guzman, who willingly accepted the task of uploading OPD cases and conducting the OPD online presentations, Dr. Alena Bantolo for helping me program the adaptive release dates, Dr. Maria Minerva Calimag for encouraging me to write this innovative curriculum and for suggesting the title, Dr. Melvin Marcial who encouraged me to implement my ideas, even though "it is difficult," Dr. Remedios Chan who invited me to present this at the Online Teaching-Learning for Medical Schools and Internship Hospitals sponsored by APMC-PAASCU and to Dean Maria Lourdes Maglinao for recognizing these efforts in her Apertura.

**Conflict of Interest.** The author declares no conflict of interest.

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