Quality Delivered: How a Pandemic Fostered Innovation and Creative Solutions in Clinical Education

Alice M. Davis
Regis University, amdavis@regis.edu

Laura LaPorta
Regis University, llaporta@regis.edu

Nancy F. Mulligan
Regis University, nmulliga@regis.edu

Stacy Carmel
Regis University, scarmel@regis.edu

Shelene Thomas
Rocky Vista University, sthomas@rvu.edu

See next page for additional authors

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Abstract

Background: Clinical education placements for students enrolled in healthcare programs were abruptly upended in March 2020 due to COVID-19. Programs were faced with decisions of how to mitigate substantive challenges due to an unforeseen pandemic within timeframes that would align with curricular sequences and graduation dates. Schools quickly modified curriculum formats, implemented alternative teaching and learning instruction and developed safety protocols to protect students, clinical faculty, and patients. **Purpose:** The aim of this study explored the strategies employed by one physical therapy school's clinical education team, which resulted in successful completion of clinical course requirements and on-time graduation. **Method:** Data was collected on a single cohort of eighty (n=80) students who experienced changes in the timing, location, and/or progression of their clinical experiences due to COVID-19 related complications. The use of innovative clinically-oriented teaching strategies including web-based patient case simulation, virtual grand rounds, and other creative learning activities effectively supported student engagement both in and outside of clinical settings. Alternative learning strategies provided students the opportunity to progress through the clinical education curriculum, meet educational objectives, and satisfy the standard requirements by the Commission on Accreditation in Physical Therapy Education (CAPTE). Performance on the Clinical Performance Instrument (CPI) for the cohort of students affected by COVID-19 was compared to a cohort from 2019 who were not affected by COVID-19 related issues. **Results:** Analysis using Mann Whitney U statistics showed there were no significant differences in performance on the CPI between the groups (p=0.874). **Conclusion:** Looking forward, there is an opportunity for schools to build on what was learned during the pandemic and apply those strategies to other non-pandemic related situations with successful outcomes. Innovative teaching and learning strategies can help to bridge the gap of time out of clinic for any student who may experience an interruption in clinical education due to injury, illness, or other situation, and can provide a way for students to progress successfully through their physical therapy education.

Author Bio(s)

Alice Davis PT, DPT OCS is an Associate Professor in the School of Physical Therapy at Regis University. She is a member of the Clinical Education Team in the Doctor of Physical Therapy Program in the School of Physical Therapy at Regis University.

Laura LaPorta PT, PhD, OCS is an Assistant Professor in the School of Physical Therapy at Regis University. She is a member of the Clinical Education Team in the Doctor of Physical Therapy Program in the School of Physical Therapy at Regis University.

Nancy Mulligan PT, DPT, OCS is an Associate Professor in the School of Physical Therapy at Regis University. She was the previous Director of Clinical Education in the Doctor of Physical Therapy Program in the School of Physical Therapy at Regis University.

Stacy Carmel PT, DPT, EdD is an Assistant Professor in the School of Physical Therapy at Regis University. She is the current Director of Clinical Education and previous member of the Clinical Education Team in the Doctor of Physical Therapy Program in the School of Physical Therapy at Regis University.

Shelene Thomas PT, DPT, EdD, GCS is an Associate Professor and Director of Interprofessional Education and Health Systems Science at Rocky Vista University. She was a previous member of the Clinical Education Team in the Doctor of Physical Therapy Program in the School of Physical Therapy at Regis University.

Denise O'Dell PT, DScPT, NCS is an Associate Professor in the Department of Physical Therapy at University of Kentucky. She was a previous member of the Clinical Education Team in the Doctor of Physical Therapy Program in the School of Physical Therapy at Regis University.

Acknowledgements

Authors

Alice M. Davis, Laura LaPorta, Nancy F. Mulligan, Stacy Carmel, Shelene Thomas, and Denise O'Dell

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Alice M. Davis[1]
Laura LaPorta[1]
Nancy F. Mulligan[1]
Stacy Carmel[1]
Shelene Thomas[2]
Denise O'Dell[3]

1. Regis Univeristy
2. Rocky Vista University
3. University of Kentucky

United States

ABSTRACT
Background: Clinical education placements for students enrolled in healthcare programs were abruptly upended in March 2020 due to COVID-19. Programs were faced with decisions of how to mitigate substantive challenges due to an unforeseen pandemic within timeframes that would align with curricular sequences and graduation dates. Schools quickly modified curriculum formats, implemented alternative teaching and learning instruction and developed safety protocols to protect students, clinical faculty, and patients. **Purpose:** The aim of this study explored the strategies employed by one physical therapy school's clinical education team, which resulted in successful completion of clinical course requirements and on-time graduation. **Method:** Data was collected on a single cohort of eighty (n=80) students who experienced changes in the timing, location, and/or progression of their clinical experiences due to COVID-19 related complications. The use of innovative clinically-oriented teaching strategies including web-based patient case simulation, virtual grand rounds, and other creative learning activities effectively supported student engagement both in and outside of clinical settings. Alternative learning strategies provided students the opportunity to progress through the clinical education curriculum, meet educational objectives, and satisfy the standard requirements by the Commission on Accreditation in Physical Therapy Education (CAPTE). Performance on the Clinical Performance Instrument (CPI) for the cohort of students affected by COVID-19 was compared to a cohort from 2019 who were not affected by COVID-19 related issues. **Results:** Analysis using Mann Whitney U statistics showed there were no significant differences in performance on the CPI between the groups (p=0.874). **Conclusion:** Looking forward, there is an opportunity for schools to build on what was learned during the pandemic and apply those strategies to other non-pandemic related situations with successful outcomes. Innovative teaching and learning strategies can help to bridge the gap of time out of clinic for any student who may experience an interruption in clinical education due to injury, illness, or other situation, and can provide a way for students to progress successfully through their physical therapy education.

Keywords: clinical education, teaching, innovation, COVID-19, simulation, curriculum, clinical competency

INTRODUCTION

Clinical education (CE) experiences for students enrolled in healthcare programs were suddenly canceled in March 2020 due to the COVID-19 pandemic. While many industries were shut down from their daily work, healthcare, education, and other essential work sectors quickly pivoted to keep moving forward.[1] Healthcare programs and students faced many new challenges regarding their clinical learning during the pandemic. Programs modified student learning to virtual platforms, either in part or full time, and in some cases schools postponed clinical learning experiences.[2-4] Multiple contributing factors caused clinical cancellations or delays including limited personal protective equipment (PPE), low patient census, and concern about student to patient or student to staff viral transmission.[3] The significant changes that occurred both in the healthcare environment and within academic institutions forced the adaptation of curriculum and clinical experiences.[5] Reduction of clinical site availability, decline in patients pursuing elective treatments, and clinical transition to telehealth left uncertainty about the availability of individuals to supervise clinical learning for students.[5] Obtaining clinical experiences for students nearest to graduation became the focus for some programs, while other programs were forced to delay clinical experiences.[3,5]

During the pandemic many healthcare education organizations worked together to support the accrediting requirements and curricular modifications needed to facilitate student graduation, and to ensure performance expectations were not lowered; these organizations included licensure and testing agencies, accrediting institutions, and professional organizations.[5] The Commission on Accreditation in Physical Therapy Education (CAPTE) set the stage regarding rules and regulations and allowed for temporary changes to Doctor of Physical Therapy (DPT) programs due to COVID-19 without pre-approval from the accrediting body to allow for learning adaptations related to COVID-19. According to CAPTE guidelines programs were required to report curricular changes in a timely manner.[6,7] Prior to the pandemic crisis, CAPTE required a minimum of 30 weeks in clinical education, and any substantive change to a DPT program's curriculum, including distance education, shortening clinical experiences, and adding in alternative learning opportunities, required programs to ensure students demonstrated entry-level competence via equivalent education plans.[7] Simulation experiences in the form of written or video case scenarios as part of the student's clinical learning were included in the alternative learning allowances by CAPTE.[6]

Alternative learning activities implemented during the pandemic allowed for students to trial established methods of learning applied in novel ways, such as simulation.[5] Simulation has been established as an effective method for preparing healthcare professional students for clinical performance for several healthcare disciplines.[8] The educational rationale for the effectiveness of simulation includes practice of clinical reasoning skills and social skills to improve student performance.[9] Practicing communication skills with immediate feedback is an important part of the learning process for students in a simulated clinical setting and students may also act as the physical therapist (PT) in specific case scenarios to gain clinical reasoning skills.[8,9] Simulation in a group setting is also effective in teaching teamwork, competency, and clinical reasoning skills and can enhance learning with immediate feedback provided by a faculty facilitator.[9] The aims of this descriptive, retrospective study were two-fold: first, to address the reduced number of student hours in the clinic due to COVID-19-related interruptions and second, to propose teaching and learning activities that could be used in other non-pandemic situations affecting student clinical time (i.e.: illness, injury, clinical instructor absence). The investigators hypothesized that alternative learning activities including simulation would result in the successful completion of CE course requirements in a physical therapy program and on time graduation of a complete student cohort.

METHODS

Approval from the University Internal Review Board was granted for this descriptive retrospective study. Data was collected on a single cohort of eighty (n=80) DPT students in the Class of 2021 who experienced changes in the timing, length, location, or progression of intermediate and/or final clinical experiences due to COVID-19 pandemic related constraints. Several variables were tracked and evaluated included: adjustments in the core curriculum and clinical education course timeframes, the number of sites scheduled, canceled, and rescheduled, the classification of sites canceled (e.g. outpatient vs. inpatient experiences), and the process by which COVID-19 policy was developed and implemented. Additionally, students' number of missed clinical days due to suspected exposure and/or positive COVID-19 test and quarantine were collected. Finally, the innovative teaching and learning activities that were developed to help advance clinical competence for students who were out of the clinic were analyzed using descriptive statistics and student outcomes on the Clinical Performance Instrument (CPI) were compared to a pre-COVID cohort.

Traditional Versus COVID-19 Adjusted Core Curriculum

Students enrolled in this physical therapy program traditionally participate in 38 weeks of clinical experiences embedded in an 8-semester curriculum (Table 1). Year 1, students do not participate in formal clinical education experiences. In Year 2 there are two clinical experiences, six and eight weeks respectively, and Year 3 there are two 12-week final clinical experiences. COVID-19 required an adjustment in the curriculum for the Class of 2021 which included modifications to Years 2 and 3. The first clinical experience (CE) occurred in Fall 2019 therefore, changes were not required. When the pandemic hit in March 2020, CE II was rescheduled from the summer semester and moved to the beginning of Year 3 based on availability of clinical sites to accommodate

DPT students. Changes in the CE dates called for immediate revisions in academic course timeframes and curriculum sequence. During the summer semester all didactic learning was conducted virtually (Table 2).

Table 1. Traditional Curriculum Design

	Fall Semester 16 Weeks		**Spring Semester 16 Weeks**		**Summer Semester 13 Weeks**
Year 1	Campus		Campus		Campus
Year 2	CE I - 6 weeks		Campus		CE II - 8 weeks
Year 3	Campus	CE III - 12 weeks	CE IV - 12 weeks	Campus 2 weeks + Graduation	

Emphasis on competency-based learning experiences versus a fixed length of time was promoted as a realistic means for students to meet clinical education objectives and CAPTE requirements. Students in this cohort that missed 5 or more clinical days during the scheduled CE II, III and/or IV experiences received individualized learning agreements. With the CAPTE allowances due to the pandemic and the requirement of a minimum of 30 weeks of clinical experiences, students in the cohort reviewed in this study had a revised schedule of 35 weeks of clinical experiences with up to 3 weeks of clinical simulation and learning activities allowed. In total, all students completed between 32 to 35 weeks of in-person experiences.

Table 2. COVID Adjusted Curriculum -Class of 2021

	Fall Semester 16 Weeks			**Spring Semester 16 Weeks**			**Summer Semester 13 Weeks**
Year 2	CE I 6 Weeks	Campus		Campus			Virtual Campus (CE II postponed)
Year 3	CE II* 7 Weeks	Campus 6 Weeks	CE III* Started 7 Weeks	CE III* Continued 4 Weeks	CE IV* 11 Weeks	Campus 1 Week + Graduation	

*Supplemental/simulated learning activities used to support clinical learning

A Closer Look at Clinical Cancellations
Clinical cancellations happen, and on average, a typical total cancellation rate for CE II, III, and IV for this program has been 4%, which can range from 2 to 10 cancellations per experience. For the Class of 2021, the average cancellation rate was 26% yielding 64 cancellations with a preponderance of the cancellations occurring within the CE II and III timeframe of May-June 2020 and October-December 2020 respectively (Figure 1). There were 25 clinical cancellations for CE II, 26 for CE III and 13 for CEIV.

In a typical year, the clinical education team works simultaneously with three DPT classes throughout the academic year, securing 330 clinical placements. Due to the high volume of cancellations, a shared, online Google Drive document was used to track cancellations, replacement sites, and student absences related to COVID-19. The tracking system streamlined the cancellation process and allowed for continuous, asynchronous communication within the team.
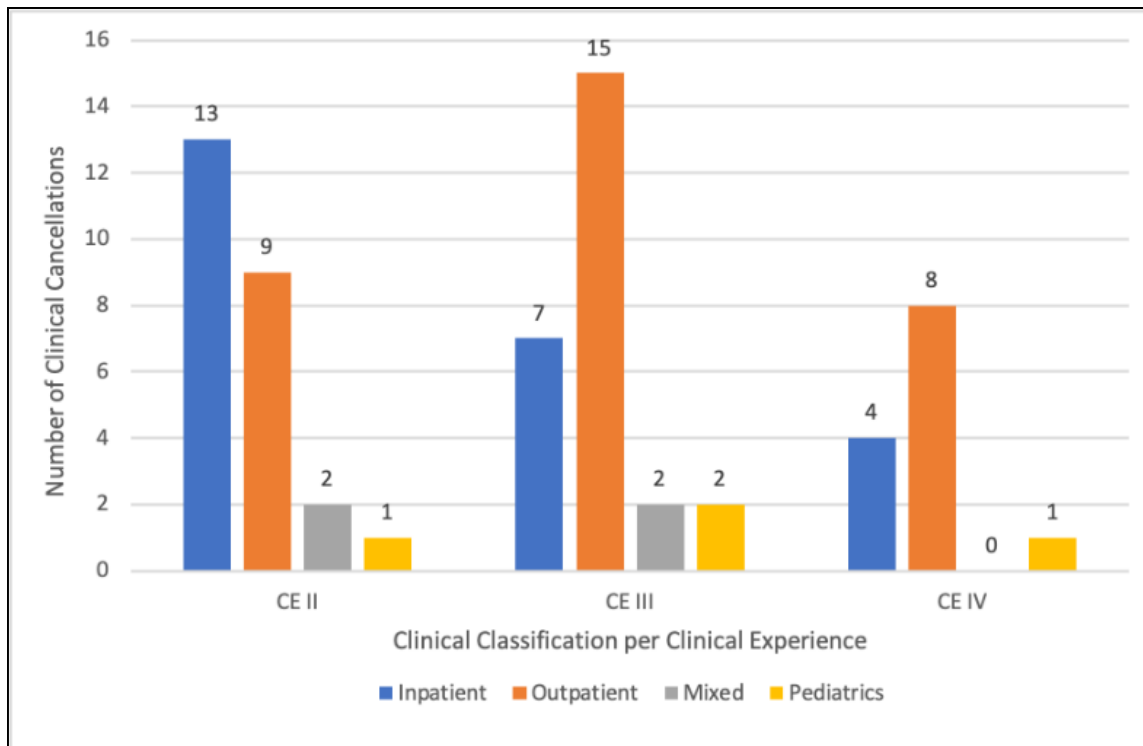
Figure 1. Clinical Classifications Per Clinical Experience

COVID-19 Policy, Procedures and Safety Plans
To meet the requirements of our community clinical partners, the University developed COVID-19 quarantine and exposure protocols, policies, and procedures for healthcare students during their clinical experiences. Every unit in the College of Health Professions worked interprofessionally to create a policy designed for student in the clinical setting, which also aligned with the University on-campus policies. Extensive review was conducted, researching public and private institutions' COVID-19 policies, and input from various unit stakeholders was obtained. The policy was then approved by the University legal department and signed by all health professional students. The policy detailed expectations related to experiential learning and adherence to site, state and University COVID-19 policy. Response to symptoms included steps of communication and quarantine, COVID-19 exposure monitoring, and the process by which students could request modifications or adaptation of experiential learning, and how experiential learning cancellations and incompletes would be managed. The policy also detailed use of the Campus Clear™ mobile application. This application was used to screen students, staff and faculty for on campus and off-campus clinical activities. Based on the answers to preliminary questions regarding exposure to COVID-19 and/or the presence of symptoms, the Campus Clear™ application was used to advise the user if they were cleared to go to the clinic or if they needed to contact Student Affairs to receive guidance on the need to quarantine, how long, and when they work be safe to resume clinical work.

In the School of Physical Therapy, students were required to read and agree to the COVID-19 policy and completed additional training in safety precautions for airborne respiratory infections and COVID-19 transmission via an online OSHA curriculum, before they were given the opportunity to participate in clinical experiences. Students were also provided with KN-95 masks and face shields for work in clinical settings. Students were allowed to file a waiver to not provide care for patients with COVID-19 with the understanding that it may delay the completion of their clinical experiences especially for the nursing students.

COVID-19-Related Clinical Absences
There were several situations resulting in time out of clinic that arose in the group of physical therapy students who were allowed to move forward into the clinical portion of their education, prior to release of the COVID-19 vaccine. These situations were all related to COVID-19 including close contact with individuals who had known COVID-19, symptoms of illness, known infection, and/or early release from clinical experiences due to site efforts to prevent, manage, or reduce COVID-19 exposures. Students that missed 5 or more days of in clinic time per CE experience required learning agreements. In situations that required learning agreements, the clinical education team developed clinically-oriented teaching strategies including web-based patient case

simulation, virtual grand rounds, and other creative learning activities to support student engagement both in and outside of clinical settings (see Appendix A, C and D).

Specific to the Class of 2021, there were a total of 28 COVID-19 related absences, in which 16 DPT students required learning agreements. In addition, unexpectedly, due to an emergency corporate-based COVID-19 mitigation policy, 7 students in post-acute rehab centers were released midway through their CE II experience. These 7 students were immediately enrolled in alternative learning plans. Additionally, 6 students had other types of COVID related absence. The remaining 15 student absences occurred in CE III or CE IV (Table 3).

Table 3. Clinic Absence due to COVID-19

Experience Name	CE II	CE III	CE IV
Date Range	August-September, 2020	November 2020-January 2021	February 2021-April 2021
Quarantine Related Absences	6	13	2
Students Early Release	7	0	0

Individualized Learning Agreements

At the point a student was absent from the clinic, each student participated in a one-on-one meeting with the Director of Clinical Education to develop an Individual Learning Agreement (Appendix A). These agreements were often created with and supported by the clinical instructor (CI) and gave the student and CI the ability to determine what independent and/or online simulated cases should be completed to help customize student learning to meet the learning objectives of the current clinical experience and long-term objectives of the program. Various learning opportunities were offered and each plan was customized to each student. It also served as a formal modification of the course syllabus and an hourly log to keep track of how long the student spent on each activity to meet the required hours for the clinical experience (i.e.: 6 hours for every day missed). Independent learning plans were developed based on conversations with students and CI feedback related to students' abilities at the time of COVID-related absence. In some cases of longer absence from the clinic, student self-assessment tools were used pre- and post-learning plan (Appendix B). A greater number of learning plans were developed for students who were absent from clinic due to COVID-19 related causes in the fall of 2020 compared to the spring of 2021 because students were able to receive the COVID-19 vaccine at their clinical site, with our local community partner networks, or within the community sometime in the spring of 2021.

Use of Simulation

Due to the challenges presented by COVID, CAPTE made a temporary allowance to use a limited amount of simulation that could replace time in direct patient care, and this could be done without pre-approval from the accrediting body. The CAPTE approved modifications included using simulation experiences in conjunction with traditional on-site clinical education experiences. Simulation has been described as a teaching-learning modality that can replace and strengthen real clinical experiences because it can evoke clinical reasoning, debriefing and reflections skills, as well as or better than live patient interaction.[10] The fidelity of the experience, either low or high, is dependent on how closely the activity mimics the realism of working directly with patients.[11] Some of the guided activities described in this paper would be considered low fidelity (i.e. virtual rounds, chart review and 2 minutes verbal case summary, and initial write up with billing submission on paper cases based on real cases); however, the high fidelity activity of simulation was also incorporated using Simucase™.

Simucase™ is an online learning system that offers virtual access to real patients who interact with the learner with actual videotaped responses (verbal and movement based) as the learner works through the simulation activities of reviewing case history, observation, communication with the patient, family and medical team, hypothesis, assessment, diagnosis and intervention (Figure 2).
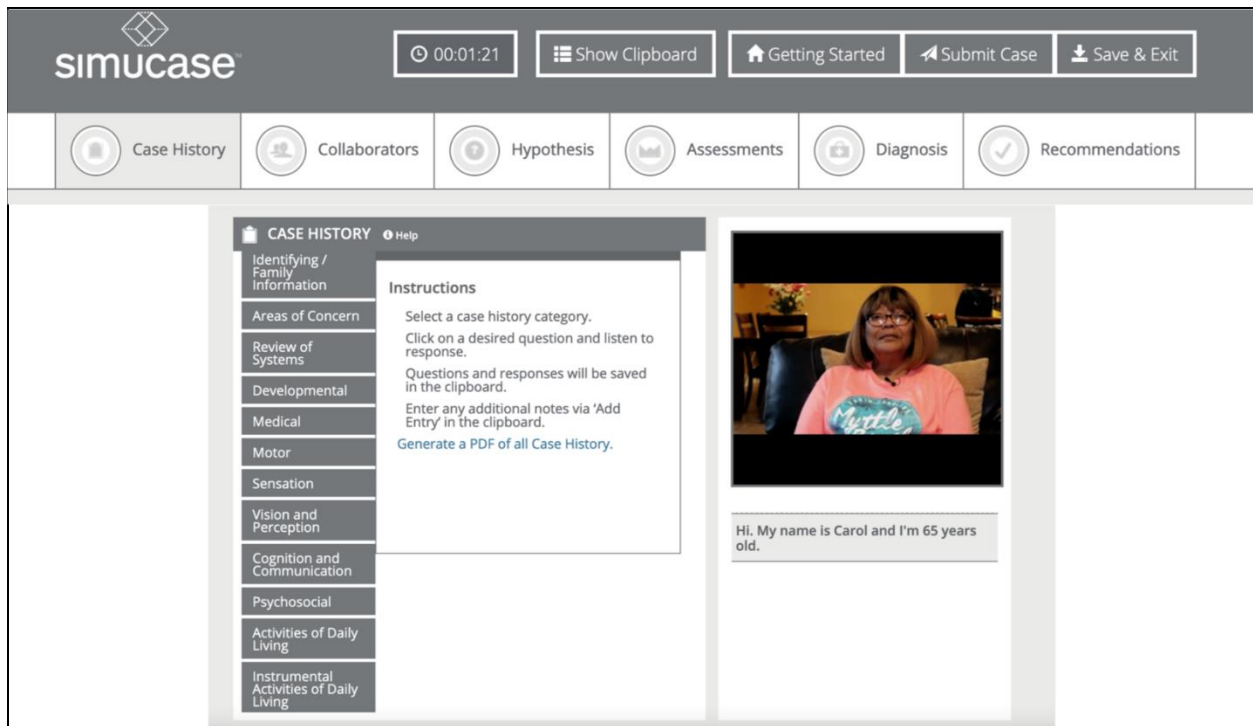
Figure 2. Example of Case History Dashboard

The quality of the simulations was robust, giving students access to a variety of patient cases (neurologic, orthopedic, pediatric) and the students were able to work through all aspects of the case with feedback or without feedback (based on the learning mode). Students were also required to make clinical decisions in each area (case history, collaborators, hypothesis, etc.) and work through every area in each tab. Simucase™ also offered interprofessional learning opportunities, as students were able to view and work through speech, audiology, occupational therapy, and physical therapy cases. An extensive video library of patient examination and intervention footage was also available and was used to augment activities when students felt they needed to develop greater depth in a particular skill area.

On the teaching side of Simucase™, faculty were given access to a debrief mode to help the faculty member facilitate discussion and/or student reflection on the simulated learning experience. Faculty could also evaluate the performance of each student user by viewing the student's mode of learning, case attempts, date and time of completion, final score percentage, and the amount of time spent on each simulation. Simucase™ also offers guidance on levels of student proficiency: 90% or more "Mastering"; 70-89% "Developing"; less than 70% "Emerging" which allows faculty to determine proficiency for students based on where they are in their clinical learning.

Based on evidence that debriefing activities are highly beneficial for learning in simulated situations, a faculty member was assigned to be the key facilitator post simulation, and faculty who were content experts were also invited to attend, to participate in the online discussions.[12] Debriefing on specific, assigned cases was done via Zoom™ meetings in the evening, a minimum of two times per week. Depending on how discussion evolved, extension activities were very fluid and were recommended by the faculty to support and augment learning for the group or the specific individuals. Students participating in the simulation were provided a syllabus detailing the various simulation activities (Appendix C).

Faculty Guided Learning Activities
Depending on the situation that led to time out of the clinic, a variety of learning options were made available to students, based on the amount of time they were to be absent from actual practice with patients. Both low and high fidelity activities were available and are detailed in Appendix D. Some of the activities were self-directed projects (i.e.: developing outcome measure recommendations for clinical sites, or additional clinical projects/in-services). Other activities incorporated information from actual patients seen in the clinic, where students took the role as both CI and PT student while engaging in learning activities with other students. Role playing as a CI, students developed case backgrounds and examination findings for 2 different cases, which other students then reviewed and verbally summarized on Flipgrid™ in a limited timeframe, as if they were talking to their CI. The "CI

students", then held a grand round on their cases for the group on Zoom™, answering peer ("PT student") questions that helped to guide clinical decision making so that the PT student could produce a timed documentation of an initial examination and plan of care including the submission of billing, referral to other disciplines, and delegation to support personnel, as needed. PT students compared and self-scored their initial examinations to exemplar documentation and faculty also read and scored one initial examination note for each student. Groups of students met on Zoom™ and participated in faculty-guided discussions on documentation, coding, billing and payment processes, discharge planning strategies, and question and answer activities with other professionals (e.g. speech-language pathologist). Students were also invited to attend free continuing education courses for COVID-19 certification, or other clinical topics of interest, engage in live or virtual practice with lines, transfers, or exercise progression, and observe clinical sessions with local outpatient partners, on-campus at the faculty practice and/or via telehealth with their clinic or other available clinical partners (Appendix D). The purpose of each activity varied, but the focus of the collection of activities was to help students progress in their clinical knowledge, clinical decision making, clinical competency, communication, and/or documentation skills including timeliness of activities to be at the pace and volume of what would be expected in the clinical setting (Appendix C).

Data Analysis
The Clinical Performance Instrument (CPI) is commonly used in physical therapy education and has been validated as a measure of student physical therapist clinical performance. The CPI consists of 18 criteria - considered foundational elements in clinical practice - in the areas of professional practice, patient management and practice management.[13] Students and their clinical instructors rate student performance at the midpoint and at the end of the clinical experiences. The CPI has a scale that ranges from 0 to 10, with "Beginner" (0) to "Beyond Entry Level" (10). A score of 8 is considered "Entry Level".

For the purpose of this research, the data for 3 groups were analyzed: the Class of 2019 (Pre-COVID), the Class of 2021 (during COVID - no disruption in time in clinical education) (n=64) and the Class of 2021 (COVID related absence in clinical education of > 1 week) (n=16). Mann Whitney U was used to compare the final CPI score ranks between the Class of 2019 (n=82) and the Class of 2021 (non-disrupted; n=64). Descriptive statistics (mean, SEM and 95% CI) of the average CPI scores, for each of the 18 performance criteria, from the final CPI of CE IV was also used to compare all 3 groups.

RESULTS
Performance on the CPI for two Doctor of Physical Therapy cohorts were analyzed: the Class of 2019 (n=82) and the Class of 2021 (n=80) using non-parametric statistics. In the Class of 2021 (n=80), 64 students completed CE II, III and IV experiences without need for learning agreements, and 16 missed 1 to 3 weeks of clinicals due to COVID and participated in an individual learning plan. Mann Whitney U was used to compare the final CPI score ranks on each of the 18 performance criteria between the Class of 2019 (n=82) and Class of 2021 not disrupted students (n=64). There was no statistically significant difference between the groups (p=.874.) Since the group of students who were disrupted was smaller than the other two groups, it was not used in the non-parametric comparison; however, all confidence intervals around the mean of each performance criteria overlap, suggesting no significant difference existed between the CPI performance of the Class of 2021 group with COVID related absences and the CPI performance of cohorts of students who did not experience COVID related absence. (Table 4 and Figure 3).

Table 4. Comparison of Average Clinical Performance Instrument Data for Class 2019, Class of 2021, and Class of 2021 Students with COVID-19 Related Absence from Clinical Experiences

CPI Performance Criteria	Class 2019 Pre-Pandemic (n=82)				Class 2021 No Disruption (n=64)				Class 2021 COVID Related Absence (n=16)			
	Mean	SEM*	95% CI		Mean	SEM*	95% CI		Mean	SEM*	95% CI	
Safety	8.6	0.07	8.41	8.69	8.7	0.09	8.48	8.83	8.6	0.20	8.23	9.02
Professional Behavior	8.8	0.08	8.64	8.97	8.7	0.10	8.53	8.94	8.9	0.15	8.57	9.18
Accountability	8.7	0.09	8.53	8.87	8.7	0.09	8.49	8.86	8.8	0.19	8.45	9.18
Communication	8.5	0.08	8.37	8.69	8.5	0.08	8.33	8.64	8.8	0.17	8.42	9.08
Cultural Competence	8.7	0.08	8.55	8.85	8.8	0.09	8.58	8.92	8.9	0.18	8.52	9.23

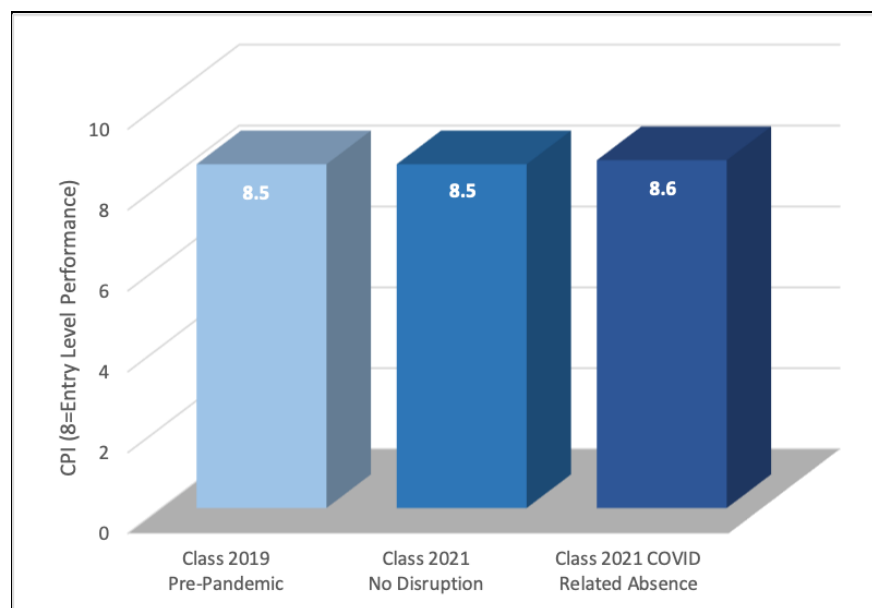|												
Professional Development	8.6	0.09	8.42	8.76	8.7	0.08	8.54	8.84	8.6	0.18	8.21	8.92
Clinical Reasoning	8.3	0.08	8.13	8.45	8.4	0.07	8.29	8.58	8.5	0.18	8.14	8.86
Screening	8.3	0.06	8.28	8.54	8.4	0.07	8.24	8.51	8.4	0.15	8.07	8.68
Examination	8.4	0.08	8.22	8.52	8.3	0.07	8.19	8.47	8.6	0.13	8.31	8.81
Evaluation	8.3	0.08	8.19	8.51	8.4	0.07	8.27	8.54	8.5	0.16	8.19	8.81
Diagnosis/Prognosis	8.3	0.06	8.19	8.41	8.3	0.07	8.20	8.46	8.4	0.18	8.08	8.79
Plan of Care	8.4	0.06	8.26	8.51	8.4	0.07	8.25	8.53	8.5	0.16	8.19	8.81
Procedural Interventions	8.4	0.06	8.31	8.56	8.5	0.08	8.38	8.68	8.6	0.13	8.31	8.81
Educational Interventions	8.5	0.07	8.34	8.63	8.5	0.07	8.40	8.69	8.4	0.16	8.13	8.75
Documentation	8.5	0.08	8.39	8.70	8.6	0.09	8.47	8.81	8.6	0.22	8.12	9.00
Outcomes Assessment	8.4	0.06	8.27	8.52	8.5	0.08	8.38	8.71	8.4	0.13	8.19	8.69
Financial Resources	8.3	0.06	8.19	8.43	8.5	0.08	8.30	8.60	8.3	0.18	7.97	8.66
Direction/Supervision of Support Personnel	8.4	0.08	8.21	8.51	8.4	0.07	8.23	8.52	8.4	0.13	8.19	8.69
Overall Average	8.5	0.07	8.33	8.61	8.5	0.08	8.34	8.66	8.6	0.17	8.27	8.93

Figure 3. CPI Outcomes of Class Affected by COVID-19 Absences vs. Class with no COVID-19 Related Interruption

DISCUSSION

It has been widely acknowledged that the impact of COVID-19 created immense challenges in healthcare education with clinical education being the hardest hit.[14-16] Traditional classroom education for DPT programs quickly transitioned to online learning in response to the global pandemic.[2-3,17] With record number site cancellations and COVID related student absences, healthcare programs had to quickly find solutions to educate students partially displaced from traditional experiential learning to satisfy education requisites set forth by academic institutions and accreditation standards. Currently, there have been no published studies on COVID-19 related interruptions of CE experiences using the CPI to measure student outcomes. This study explored the impact of COVID-19 on CE experiences within a DPT program and identified effective teaching and learning activities that fostered clinical proficiency when students were unable to participate in direct clinic care activities with patients.

Clinical education traditionally structured in direct patient care experiential learning had to find alternative strategies to best support and develop student's clinical skills and engagement outside of clinical settings.[15,18] The integration of alternative teaching approaches emerged out of necessity to foster clinical learning that would most closely align to what students would be learning in the clinical setting. Recent studies have detailed a variety of approaches such as: interactive asynchronous and synchronous faculty-guided case studies; virtual simulation with patients seeking physical therapy services; interprofessional education using virtual simulation with occupational therapy, audiology, and speech language pathology patients; telehealth observations of live patient interactions; virtually facilitated structured clinical examination; and frequent opportunities to debrief with faculty.[19-22] The strategies deployed were as individualized as possible, and the experiences were thoughtfully selected to expose the learners to situations, timeframes scenarios, and clinical decision-making that would be experienced in the clinical setting. Virtual debriefing with faculty was also used and included extension activities related to student needs or evidence deficiencies (e.g. intervention progression or regression ideas; evidence to support use of particular outcome measures, or meaningful clinical change in outcomes; current procedural terminology coding; medical terminology, or discharge planning instructions).[21]

We now have evidence that shows that simulation used in physical therapy education is effective to promote clinical reasoning for participants and observers, stimulates self-reflection and observation, and fosters self-efficacy for future clinical practice.[22] Results from the current investigation supports the use of low and high fidelity simulation education strategies in lieu of time in the clinic to allow DPT students to successfully progress through a series of clinical education experiences and end at, or beyond entry-level performance on all performance criteria of the CPI. Specifically, student achievement on the 18 Physical Therapy performance criteria. With exception to three DPT students that were off-cycle for non-related COVID-19 issues, 80 DPT students in the Class of 2021 met or exceeded entry-level performance on all CPI criteria at the time of graduation This included students that experienced COVID related absences requiring time out of clinic from a few days up to three weeks. Further, comparison between the Class of 2019, which completed a traditional uninterrupted curriculum, to the Class of 2021 yielded similar CPI performance outcomes in all 18 criteria.

Indirectly, this study placed a spotlight on implications for faculty workloads when unforeseen events such as a global pandemic requires immediate revision in instructional formats and course sequencing, including clinical education. This rapid shift, placed additional teaching and administrative responsibilities on faculty and academic administrators without adjustments in workload. Fortunately, for this program an experienced faculty member joined the school of physical therapy in August 2020 who had 50% workload allocation in clinical education. The timing of this hire aligned well with the Class of 2021 revised CE II, III and IV experiences and the clinical interruptions that ensued due COVID-19 related student absences. The faculty member worked with the director of clinical education to investigate, develop and implement individualized learning agreements, faculty guided learning activities and simulation experiences. Notwithstanding this additional faculty member, the increased workload on the clinical education faculty was ever present and suggests the need for future investigation on workload including strategies such as "buffers" and policies to address increased demands in faculty and administrative time when abrupt interruptions in curriculum formats occur.

Limitations

The findings from this study conducted at one DPT program with a single cohort may not be generalizable to other DPT programs. A broader investigation looking at additional cohorts is needed to assess the efficacy of alternatives to teaching and learning activities when interruptions in face to face experiential learning occur and how this may impact student outcomes. A rigorous assessment of other student outcomes such as NPTE pass rates, and qualitative data related to the impact on student and clinical instructors' perception on clinical competency were not assessed. Evaluation of student confidence upon return to clinic or following graduation were also beyond the scope of this study and could be the focus of future investigation.

CONCLUSION

Short-term interruptions in formalized CE experiences for DPT students can be successfully supplemented by alternative learning activities that include simulation and debriefing activities. These innovative teaching strategies can bridge the gap of time out of clinic and produce positive educational outcomes of entry-level performance on the CPI and timely completion of degree requirements.

Healthcare education programs have a unique opportunity to learn from changes imposed by the pandemic and re-evaluate curriculum and accreditation requirements related to time in direct patient care. Allowances for high fidelity simulation activities in clinical education curricula could reduce the time burden on clinical educators, address interruption in clinical education due to student or clinical instructor emergency, injury, or illness, and help foster clinical decision-making, enhance technical skills sets, and improve self-efficacy and interprofessional awareness to prepare future healthcare professionals to meet the ever-changing needs of patient care.

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[keep scrolling to Appendices A, B, C, and D]

APPENDIX A
EXAMPLE OF INDEPENDENT LEARNING PLAN

Student Name_____   Clinical I   II   III   IV

Selected "X"	Activity	Description	Expected Time Investment	Completed Yes/No
	Patient case specific research		8 hours	
	Patient case planning		6 hours	
	Additional clinical site project		6 hours	
	Additional in-service preparation		6 hours	
	Simucase™ training; performance expectations	Orientation on how to use Simucase™	1 hour	
	Simucase™ Physical Therapy cases	Specific patient cases assigned. Student works independently on each case to achieve required proficiency.	Varies based on number of cases	
	Simucase™ interprofessional case(s)	Student works through patient cases developed for SLP, OT and/or Audiology.	Varies based on number of cases	
	Simucase™ Grand Rounds	Student meets via Zoom, two weeknights per week for 30-45 minutes to discuss assigned cases with other students who are out of clinic due to COVID-19, PT faculty and invited guest faculty (based on content expertise).	30-45 mins biweekly	
	Simucase™ video review activity	Video reviews assigned to help students build examination and intervention skills in areas where further development needed.	1 hour per video	
	Patient Treatment Observation	Virtual observation and documentation with CI supervision	Varies based on number of cases	
	Telehealth opportunities	Student to observe and/or facilitated telehealth visits with patients at their assigned clinic.	Varies based on clinic	
	DPT lab activity/mentoring		Varies based on class schedule	
	Faculty practice observation		Varies based on census	
	Leadership development		Varies based on plan	
	APTA Chapter involvement		Varies based on plan	
	Other (describe):			
TOTAL HOURS				

_____   _____
Student Signature   Date

_____   _____
Director of Clinical Education Signature   Date

APPENDIX B
PRE AND POST SELF-ASSESSMENT TO GUIDE INDEPENDENT LEARNING PLANS
AND EVALUATE LEARNING PLAN OUTCOMES

Please complete the survey below thinking about how you felt on your last day in your recent clinical experience. Use the phrase below to guide your response. Mark the appropriate box with an "X". Please reply to each clinical skill question.

"I feel confident to perform the following clinical skill at or above an intermediate level (as described on the Clinical Performance Instrument) with patients who would typically be treated in inpatient and/or skilled nursing environments".

Clinical Skill	Strongly Disagree	Disagree	Agree	Strongly Disagree
Chart review				
Subjective examination of patient				
Effective communication strategies with patients with cognitive impairments				
Identifying precautions for common diagnoses				
Having a plan prior to engaging patient				
Objective examination of patient				
Clinical rationale for examination choices				
Clinical rationale for intervention choices				
Breadth of IP/SNF intervention options				
Depth of IP/SNF intervention options				
Developing a patient identified problem list				
Safety managing lines				
Safety with weight bearing precautions				
Assessment/PT diagnosis				
Prognosis				
Writing a plan of care				
Developing a patient identified problem list				
Writing SMART short-term goals				
Writing SMART, functional long-term goals				
Safety managing lines				
Patient/family education				
Discharge planning				
Documentation – medical terminology/phrasing				

APPENDIX C
SIMUCASE™ TUTORIAL FOR CLINICAL ABSENCE

Using Simucase, the student will be able to meet, or exceed stated objectives at a "Developing" level, which is a competency measure of 70 to 89% on each assigned simulation and any extension activity, which includes, but is not limited to: participation in virtual rounds, part-task trainer simulations, video assignments, treatment plan progression, and medical documentation.

Simucase Objectives:
1. Appraise various resources of information on the patient/client and adapt the examination to the patient/client.
2. Evaluate the patient/client examination-information, using clinical reasoning, and evidence-based practice including outcomes assessment and select an appropriate diagnosis and prognosis.
3. Analyze effective, evidence-based procedures and modify procedures, based on diagnosis/prognosis and patient/client response.
4. Support physical therapy actions via effective documentation incorporating all aspects of patient management
5. Relate and select effective and respectful education regarding condition, intervention, and plan of care with appropriate, culturally relevant, patient/client centered communication.
6. Compare and perform professional behaviors in all clinical interactions and professional settings within the APTA Code of Ethics, Standards of Practice and Core Values.
7. Influence knowledge in practice with evidence, in collaboration with healthcare personnel, patient/client/caregiver, and community with consideration of financial resources.
8. Evaluate and adapt safe practice methods in all clinical interactions and professional settings.
9. Select appropriate tasks to delegate and complete required supervision of personnel.
10. Differentiate decisions through professional development by expanding physical therapy evidence and knowledge in practice

LEARNING EXPERIENCES: The format for this course will be:
1. Simulation
2. Facilitated group discussion and debrief activities in a virtual meeting room
3. Presentation: oral and/or written

MAJOR CONTENT AREAS: The primary goal of this course is to prepare you to:
- Examination and evaluation of clients/patients with any diagnosis in any setting
- Refinement of clinical decision making
- Incorporation of educational activities to influence a variety of audiences
- Application of a comprehensive plan of care
- Comparison of individual outcomes to evidence in the literature
- Incorporation of non-patient care opportunities
- Professional Socialization

REQUIRED COURSE MATERIALS:

Texts:
- *Physical Therapist Clinical Performance Instrument* (2nd edition). Alexandria, VA: American Physical Therapy Association 2006. https://cpi2.amsapps.com/user_session/new
- *Guide to Physical Therapist Practice* (2nd ed). Alexandria, VA: American Physical Therapy Association; 2001:1-768.
- Regis University. *Clinical Ed Manual Class of 2022,* Denver, CO: Regis University.

Reading/Articles:
- NA

Internet:
- Zoom™ meeting room: Link provided

Tools:
- Simucase™: www.simucase.com
- Simucase™ Assessment

Recommended Course Materials:
- Simucase™ User Guide https://d1e47g7vecbcl4.cloudfront.net/pdf/SC_1117_UserGuide_Sept2020.pdf
- Simucase™ Quick Guide
  https://d1e47g7vecbcl4.cloudfront.net/pdf/SC_1117_QuickGuide_19554_KO_Update_2019.pdf
- Simucase™ Browser Test https://www.simucase.com/case-studies/browser-test

Simucase™ Schedule

Case	Assignment	Minimum Time to Complete
PT: Rip Assessment	Complete simulation with developing proficiency	60 minutes
PT: Rip Intervention	Complete simulation with developing proficiency	90 minutes
PT: Bruce Intervention	Complete simulation with developing proficiency	75 minutes
PT: Roberta Intervention	Complete simulation with developing proficiency	60 minutes
PT: Eleni Assessment	Complete simulation with developing proficiency	75 minutes
PT: Erica Intervention	Complete simulation with developing proficiency	60 minutes
OT: Shawn	Complete simulation with emerging proficiency (60-70% competency)	45 minutes
OT: Debbie Intervention	Complete simulation with emerging proficiency (60-70% competency)	90 minutes
OT: Stress Management Group Intervention	Complete simulation with emerging proficiency (60-70% competency)	40 minutes
OT: Ray Assessment	Complete simulation with emerging proficiency (60-70% competency)	60 minutes
Video Watching: TBD	Will be assigned based on case debrief and/or clinical questions	
Video Watching: TBD	Will be assigned based on case debrief and/or clinical questions	
Video Watching: TBD	Will be assigned based on case debrief and/or clinical questions	
Zoom Meetings	Weekly every Tuesday and Thursday from 7 p.m. to 8 p.m. Meeting link provided	

APPENDIX D
EXAMPLES OF INTEGRATED VIRTUAL EDUCATION TUTORIAL
LEARNING ACTIVITIES

Overview: This integrated virtual education tutorial has been designed to complement your on-site clinical learning. The objective is t6o ensure that you have achieved an intermediate level of proficiency by the end of this clinical rotation in all course objectives. All activities will be graded on a pass/fail basis. You must achieve a "Pass" on every assignment to pass this tutorial.

Activity	Description of Deliverable	Estimated Faculty Time	Purpose/Outcome
Pre Tutorial Self-Assessment Survey and Personal Learning Plan (1)	Complete and post in assignment dropbox in D2L.	1 hour to design and disseminate See Assessment Appendix B for example assessment	Self-reflection on skills requiring more rehearsal, development and/or feedback. Used as point of subjective comparison pre- and post-learning plan completion.
Functional Outcome Assessment Recommendations that can be used by PTs/PTAs in setting (minimum of 3)	Create a user-friendly PowerPoint, pdf, or Spark Video that includes: ● Brief overview of tool use and value in setting ● Time to use ● Link to actual tool ● How to score ● MCID (if available	N/A	Identify best outcome measures to be used in current clinical setting, Opportunity to find/save, score and apply MCID evidence to the instrument. Activity generated a helpful resource for the clinical site and for the student/graduate to use in future patient care activities.
Additional **In-Service/Clinical Project**	Topic/project to be approved by CI and presented via Zoom. CEA or CI must provide approval of topic (verbal or email).	N/A	Activity generated a helpful resource for the clinical site and a topic-specific learning activity of interest for the student.
Activity	**Description of Deliverable**	**Estimated Faculty Time**	**Purpose/Outcome**
Patient Case Assignment Overview **(6 parts to this assignment)**	Watch instructional video (created using Spark™). **Note.** Each student will act as a "CI" for 2 cases and will review 6 additional cases in the role of "PT Student".	1 hour to create Spark video	Spark™ video technology used to create an engaging, short overview of the 6-step Patient Case Assignment to augment what was stated in the syllabus. Provided a way for students to review

			instructions asynchronously, yet synchronized the peer group activities and deliverables. Also served as a resource that could be reviewed repeatedly as needed to enhance understanding of project expectations.
Patient Case Assignment – Part 1 **Case Creation** **(Lower Fidelity Activity)**	**Students acting as a CI:** ● Develop 2 patient cases, based on patients you worked with during your rotation. ● You will create 2 documents for each case: (1) Patient Background and History and (2) Examination Findings for the initial visit. Upload both documents in our shared folder on D2L.	N/A	Student communicates specific details of a real, de-identified patient case in writing, with accuracy and depth to allow someone else to perform a "chart review" of the data and develop a plan for evaluation and intervention. Allowed students the opportunity to think like a CI and lead case discussions on actual cases with which they were familiar.
Activity	**Description of Deliverable**	**Estimated Faculty Time**	**Purpose/Outcome**
Patient Case Assignment – Part 2 **PT Intern Case Review and Case Summary on Flipgrid** **(Lower Fidelity Activity)**	**PT Intern:** Select 6 cases to review. Use link on Google Drive to view case diagnoses. After reading the case history/background information (only), organize your thoughts (quickly), and perform a 2-minute case video review for your CI on Flipgrid. Include your intervention plan for the today's visit. (Your username is your first initial and last name – all lowercase, no spaces). Flipgrid™ link provided. Include the following in your case review: - Patient demographics - Key aspects of past/current medical history - Known precautions - Plans for subjective and objective examination - Plans for intervention	1 hour to upload student cases to shared Google folder, create spreadsheet to choose cases, and share link with students. 1 hour to set up Flipgrid and share link (for faculty with no experience with Flipgrid™; less for experienced faculty).	14 cases created by students available to peers. Students acting as "PT Students" selected 6 cases of interest (based on diagnosis information only). "PT Students" reviewed background information on each of 6 cases and had to produce a 2-minute summary of each case verbally with key information as if speaking to the CI. This portion of the project was designed to help students strategize how to review a high volume of cases quickly to meet a deadline (similar to

			a patient care day), and keep the details separate, while also learning how to pull key information from the case to discuss with their CI in a timely, professional manner. The use of Flipgrid™ allowed students and faculty to do the activity asynchronously. All conversations on Flipgrid ™were threaded per patient case, so it was possible for students to see what other students said for a particular case, and learn from the example of others.
- End with request for CI feedback **Note.** Please post case review with CI Name and patient dx.			
Activity	**Description of Deliverable**	**Estimated Faculty Time**	**Purpose/Outcome**
Patient Case Assignment – Part 3 **CI feedback on case reviews** **(Lower Fidelity Activity)**	**Students acting as a CI:** Review all Flipgrid™ case summaries and post Flipgrid™ video feedback to PT Interns. Include at least 1 point of actionable feedback for your PT Intern. **Note.** Virtual tutorial coordinator (faculty member) will also provide actionable feedback on at least 1 of each student's cases.	10 minutes per student for faculty to provide student feedback on Flipgrid™.	"Student CIs" reviewed what the "PT Students" said and provided verbal feedback on Flipgrid which helped them with their understanding of what CIs expect from student communication related to patient cases. The faculty coordinator also provided actionable, verbal feedback on Flipgrid to "PT Students" to assist with their development as well as to serve as an example of how to provide feedback to the "Student CIs". All conversations on Flipgrid™ were threaded per patient case, so it was possible for students to see what other students and faculty said and learn from those examples.
Patient Case Assignment – Part 4	**Students acting as a CI**: Guide a discussion/round of cases at assigned times for PT Interns during scheduled group session on Zoom.		Each patient case was scheduled for a 30-minute Grand Round on Zoom which was lead by the "Student CI" (faculty only

CI/PT Intern Rounds on Cases (Lower Fidelity Activity)	**PT Students**: Review the examination findings from the CIs and come to rounds with questions to help guide case write ups.	1 hour to set up Rounds and check-in to gauge student participation during the activity	monitored the Grand Rounds). "PT Students" joined Zoom when their selected cases were being discussed. Served as an opportunity for "Student CIs" to share greater details of the case and engage conversation about the case based on the experiences they had with the actual patient.
Activity	**Description of Deliverable**	**Estimated Faculty Time**	**Purpose/Outcome**
Patient Case Assignment – Part 5 **PT Intern Case Timed Write Up** (Lower Fidelity Activity)	**PT Students**: Select at least 3 cases to write up. Completed cases should be posted in assignment dropbox in D2L. Cases should include: - Patient demographics/dx - Reason for referral to PT - Key PMH/Current Med Hx - Summary of subjective exam - Objective exam findings - Written POC (Assessment, PIP, STG, LTG) - Patient/family education - Referral/community resource - Referral to other disciplines - Delegation to support personnel		"PT Interns" wrote up initial examinations and a plan of care for 3 of the 6 cases they selected in one 24-hour period. The volume and timeframe of completing initial evaluation and plan of care documentation was designed to help students work on timeliness of documentation. Students were encouraged to time themselves with each write-up to see if they could become more efficient with each note.
Patient Case Assignment – Part 6 **PT Intern Write Up Reflection** (Lower Fidelity Activity)	**PT Students:** Compare/contrast your initial examination write up to the example initial examination written for the case (prepared by faculty). Write a written reflection of strengths and things you can improve. Give yourself a score out of 100. Post in assignment dropbox in D2L.	1 hour per note to create exemplar note 20 minutes per note/student to review and comment on student notes	Faculty completed exemplar notes for each student to review. Students asynchronously compared and contrasted their note to the exemplar note and self-reflected on a score for themselves as well as strengths and areas needing improvement. Faculty also reviewed the student self-reflection and scored the student note to provide feedback on their quality and score

			(similar/different from faculty score assignment).
			All documentation feedback and reflection activities were done to help students understand quality expectations related to documentation.
Activity	**Description of Deliverable**	**Estimated Faculty Time**	**Purpose/Outcome**
Participation in Zoom meeting activities - Patient Case Assignment activities - Documentation (medical abbreviations, phrasing, timed activities) - Coding, billing, payment processes - Discharge planning check list - Guided session by a Speech Therapist (communication strategies for patients with cognitive impairment) **(Lower Fidelity Activity)**	These events will be scheduled daily from 8 to 9 AM. Dates TBD.	20 to 30 minutes per case to prep for Zoom meeting case debriefing	Daily Zoom meetings were designed to facilitate synchronous communication and learning for cohorts that had more time out of clinic. Topics were identified by the faculty coordinator and addressed areas where students would benefit collectively from the information and guided discussion with faculty or invited experts.
Simulation using Simucase™ **(High Fidelity Activity)**	See Appendix C for details related to simulation assignments.	1-2 hours per case to review case, prep for Zoom meeting debriefing, and invite affiliate faculty content experts to participate in case discussion.	See Appendix C for details related to simulation assignments.

Activity	Description of Deliverable	Estimated Faculty Time	Purpose/Outcome
Extra Opportunities (available based on interest, but not required) - COVID-19 Certification (FREE) - Continuing education courses (FREE) - Ascend Conference with WebPT (FREE) Live/Virtual 9/24-9/26/20 - Live practice with lines, transfers, exercise progression (building the intervention toolbox) - OP observation - Telehealth observation			Students were given the opportunity to self-select activities of interest (some virtual, some live) as part of their learning plan to help individualize their experience and opportunities for growth.
Post Tutorial Self-Assessment Survey	Complete and post in assignment dropbox in D2L.		Self-reflection on what was learned and areas that continue to require growth and development.