

CENTENNIAL SCHOLAR CAPSTONE PROJECT

Review of Use of Clinical Education Data
Management Systems by Academic Physical Therapy Programs

Report to ACAPT Board of Directors

February 2, 2022

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Executive Summary

The American Council of Academic Physical Therapy (ACAPT) Centennial Scholar Capstone Project was initiated in August 2020 as part of the American Physical Therapy Association (APTA) Centennial Scholar Program. Dr. Erin Green, PT, DPT, an Assistant Professor at CSU (California State University) Sacramento, was selected from a pool of applicants to be the ACAPT Centennial Scholar in August 2020. Work on the National Consortium of Clinical Educators (NCCE) capstone project was initiated in September 2020. The purpose this capstone project was to review existing clinical education (CE) data management systems to better understand the capabilities and features of these systems and collect and analyze survey data on how academic physical therapist (PT) programs are currently using and what they value about their current systems. Survey data collection and analysis, meetings with various stakeholders and CE vendors, and a review of the literature and the work of previous task forces informed the discussion and recommendations presented in this report.

The outcome of this project includes 6 recommendations for consideration by the NCCE and the ACAPT Board of Directors:

1. Pause discussions surrounding recommendations for a newly constructed national/centralized CE data management system at this time.
2. Explore opportunities for data mining within the current landscape of CE data management systems.
3. Collaborate with key stakeholders in CE data management, i.e., PT stakeholders and third-party CE management vendors, to identify sustainable and standardized methods to capture, store, and analyze data that minimizes data collection burden to CE faculty.
4. Convene key stakeholders to identify the most relevant data within the current CE data management system landscape that is desired to inform knowledge discovery in databases for PT education.
5. Continue to actively promote a culture of shared data.
6. Investigate the impact of CE data management platforms on *all* clinical education stakeholders.

Summary of Work

Introduction

Authors of previous professional groups and summits from both the APTA and ACAPT called for a critical need to better understand all aspects of CE and have made recommendations as to how to pursue best practices in PT education.¹⁻⁵ However, understanding of CE is hindered by a lack of relevant research.⁴ Inability to connect data sets through an interoperable framework has been identified as a reason for the paucity of research and a contributing factor to the limited understanding of the current state of CE.^{1,6}

Knowledge discovery in databases (KDD) is the overall process of turning low-level data into high-level knowledge.⁷ Data mining is the practice of analyzing large databases, i.e., “Big Data”, to generate latest information and is a critical step in the KDD process.^{7,8} Big Data involves the aggregation of large and *heterogeneous* databases, and educational analytics is the investigation of single or aggregate data sets to identify patterns of performance or practice.⁹ Barriers that can limit the KDD process include: larger databases, high dimensionality, overfitting, assessing statistical significance, changing data and knowledge, user integration and prior knowledge, and integration with other systems.⁷ Heterogeneity of software and organizational policies have also been proposed as additional challenges to analysis of Big Data in healthcare education.⁹ Many of these barriers are also perceived to be barriers to accessing the large volume of data in physical therapy CE.^{1,2,6,10,11} Exemplar models of educational analytics through data mining has been used to navigate the large volumes of data and information housed in healthcare systems and health profession education (HPE).^{8,12-14} Use of analytics in Big Data addresses many of the limitations of HPE scholarship, including but not limited to small numbers of participants, single program design, and limited generalizability.⁹

Stakeholders in CE, both in academic programs and at clinical sites, use various data management systems to collect, organize, and store information related to CE operations. Most of these operations are related to the CE placement process. The Placement Process Task Force (PPTF) defined the CE placement process as: “A series of actions taken by academic and clinic sites to request, offer, and confirm full-time clinical education experiences. The process includes the placing of students, acquiring and/or maintaining clinical education agreements, and onboarding of students and communications between academic programs and clinical sites regarding the acceptance or declination of clinical education experience offers.”^{10,11} In addition to the placement process, other operations completed within a CE data management system may include collection of data related to the quality and nature of the clinical experience, e.g., data from the APTA Physical Therapy Site Evaluation (PTSE), and/or data from student performance tools. CE stakeholders may use one or more management systems to complete CE tasks. Examples of such systems include institutionally-development databases, Excel spreadsheets, and/or university-controlled databases. CE stakeholders may also contract with commercial vendors, known as Software as Service (SaaS) platforms who will collect, hold, and assist in the management of CE data and processes. Examples of SaaS platforms commonly used in PT education include EXXAT, Acadaware, PT Education Manager, eValue, and Castlebranch.

Clinical education stakeholders in PT education generate a high volume of data within their CE data management systems. Access to this Big Data could inform the challenges facing CE as highlighted in the work of other authors and task forces. These include but are not limited to: challenges related to the placement process; unknown variability in structure and timing of individual clinical experiences;

consistency across programs in breadth and depth in the settings for clinical experiences; qualifications of CE faculty; and quality of individual CE sites.^{1,2,4,6,10,11}

Variability of platforms used and how data is collected across academic programs creates significant barriers to data mining in PT education. SaaS platforms hold substantial amounts of data related to CE. However, there have been concerns regarding the utility of data mining within these systems since academic programs have complete autonomy and ownership of their data. The value of Big Data collected from SaaS systems has been questioned due to the perceived inherent inconsistencies in data collection procedures, timing, and interpretation across academic institutions.⁶ Due to the perceived barriers to data mining within current CE data management systems and a lack of interoperable systems, a centralized, or national, system for CE data management has been recommended.^{1,2,10,11} A centralized, or national, system for CE data management could reduce obstacles to effective KDD and data mining strategies to enable better understanding of Big Data in CE.

The original charge for the APTA/ACAPT Centennial Scholar capstone project proposed to review the current benefits and challenges with existing CE data management systems to design the concepts for the creation of one centralized database that would support all programs, their clinical partners, and students. Further discussions related to this charge revealed that there was limited knowledge about the current landscape of CE data management. A centralized system would require meaningful change and departure from the status quo and day-to-day operations of academic PT CE stakeholders. General understanding of how or why CE stakeholders select data management system(s) was not well understood. The BPCETF 2017 report also stated: “Significant changes to academic and clinical education models will require a degree of consensus and cooperation among multiple stakeholders with competing priorities and varied perspectives that could or might result in uncharted disruptions to practice and education.”¹ The pursuit of a centralized CE data management system cannot be feasible until there is greater insight into the needs and current operations of CE stakeholders who are the ultimate end users of such a centralized data management system. Thomas Edison wisely advised: “Focus on how the end-user customers perceive the impact of your innovation – rather than on how you, the innovators, perceive it.”

To better understand the current state of CE data management systems and in acknowledgment of the broad scope of the original capstone objective, the project charge was narrowed:

Purpose

Review current benefits and challenges with existing CE data management systems to inform the feasibility of the creation of one centralized database.

Objectives

1. Review existing CE data management systems to understand capabilities and features of individual systems
2. Collect survey data on how PT programs are currently using and what they value in their existing CE data management systems.
3. Analyze and interpret survey data to identify patterns of utilization by academic PT programs.
4. Summarize findings and provide recommendations for next steps in the assessment of feasibility of a national/centralized CE data management system in a final report to be submitted to ACAPT Board of Directors.

Project Summary

The ACAPT Centennial Scholar Capstone Project was initiated in September 2020 as part of the APTA Centennial Scholar Program. The Centennial Scholar met monthly with the NCCE Leadership to establish project objectives and discuss implementation of the project. The NCCE Leadership Team provided important context for data collection needs of their stakeholders and ACAPT. In addition, they identified seminal reports and literature relevant to the scope of this project. They also connected the Centennial Scholar with stakeholders who could further inform the project.

Between December and April 2021, interviews with various sources and a literature review were conducted to inform the development of a national survey to be disseminated to ACAPT member CE academic stakeholders. In April 2021, a preliminary version of the survey was disseminated to a regionally diverse group of expert panelists, who were selected based on their experience as long-standing Directors of Clinical Education (DCE) at their respective institutions. A final version of the survey was distributed to DCE's at ACAPT-member academic institutions in June 2021. The survey was closed in July 2021. A qualified statistician was recruited to support statistical analysis of the survey data. These findings of meetings with stakeholders, vendors, literature review, and survey analysis have informed this final report to the ACAPT Board of Directors.

Meetings with Stakeholders & other Related Parties to Health Professions Clinical Education

Early meetings with stake holders emphasized increased understanding related to the use/application of CE data management systems, perceived challenges, and strengths of distinct types of programs, and/or features included in individual SaaS programs to better inform survey development.

- NCCE Leadership (on-going)
 - o Dr. Janice Howman (NCCE Chair), DCE, Ohio University
 - o Dr. Tawna Wilkinson (former NCCE Vice Chair), Director of Curriculum, Tufts University
 - o Dr. Jamie Bayliss (NCCE Secretary), DCE, Mount St. Joseph's University
- Dr. Kimberly Topp, Professor and Chair Emeritus at UCSF, Chair of the Task Force to Explore Data & Technology (past) and Joint Task Force on Data, Technology, Benchmarks and Recognition of Excellence (current) (on-going)
- Sandy Brooks, ACAPT Executive Director (on-going)
- Attendance at Education Leadership (ELC) Conference NCCE Regional Networking sessions (October 2020 and 2021)
- Dr. Bryan Coleman-Salgado, DCE, CSU Sacramento, President of the Northern California Clinical Education Consortia (December 2020)
- Attendance at Northern California Clinical Education Consortia Business Meeting (December 2020)
- Stephanie Cuozzo, Business Development Manager CORE Higher Education Group, (November 2020)
- Kunal Vaishnav, Co-founder, and COO, EXXAT (January 2021)
- Jim Porterfield, CEO, Acadaware (January 2021)
- Dr. Donna Applebaum, DCE, MGH Institute of Health, Department of Physical Therapy; former NCCE Chair (January 2021)

- Attendance at ASAHP (Association of Schools Advancing Health Professions) webinar: Clinical Rotation Management Platform: Academic and Industry Perspectives (January 2021)
- Attendance at Education Combine Section Meeting NCCE Open Forum (February 2021)
- Attendance at ELC Open Forum (October 2021)
- Dr. Sean Gallivan, DCE, University of Dayton (December 2021)

Review of Literature and Profession-based documents

A literature review was conducted to identify examples of CE data management systems used in health professions for educational analytics and to reveal how these analytics and Big Data inform challenges faced by CE. In addition, profession-based documents were reviewed to collate findings and recommendations of previous APTA and ACAPT groups regarding CE data management systems and rationale for development of an interoperable, national CE data management system.

Survey Research

The survey research protocol was reviewed and did not fall under the purview of oversight by the Internal Review Board (IRB) at California State University, Sacramento. The survey was a prospective, cross-sectional survey study. The primary aims and associated questions were informed by meetings with stakeholders and related parties and the literature review described above and derived by a formative committee consisting of members of the NCCE leadership team and the Centennial Scholar. The PT CE Glossary was referenced to ensure uniform CE terminology. Operational definitions for various CE database system features were provided. (See Appendix 1.) After the initial version of the survey was developed with consensus from the formative committee, an invitation for feedback was sent to 10 experts in the field of CE to further improve survey content validity and clarity. For the purposes of the survey, a “clinical education data management system(s)” was defined as any combination of the following: SaaS programs, e.g., EXXAT, Acadaware, etc., institutionally developed spreadsheets, and on-boarding systems, e.g., Castlebranch. Interviews with stakeholders and feedback from the expert panel informed which CE data management systems would be included in survey prompts. The complete survey included the following: (Full survey available upon request.)

- Demographic questions
- Inquiry related to the types of CE data management system(s) used for CE management for each of the following purposes:
 - Clinical placement process, e.g., matching or slot request
 - Clinical education agreement tracking
 - On-boarding tracking and/or repository
 - Clinical site database
- Level of satisfaction with current systems
- Plans to change systems within the year
- Frequency for use of various features in CE management systems
- Importance of various features in selection of a CE management system
- Agreement related to functionality of CE data management systems
- Administrative leadership influence in selection of a CE data management system
- Data entered into CE data management system related to:
 - Clinical site information
 - Clinical experiences

- Clinical instructors
- Student performance
- Data extracted from CE data management system
- Use of CE data to inform programmatic decisions

Academic representatives at ACAPT member academic institutions who were involved in CE at a PT academic program, e.g., DCE, Assistant DCE, or other CE administrator or faculty member immediately involved with the CE processes at that institution, were invited to participate in the survey via email. The NCCE maintains a contact database for all its members. Not all ACAPT member programs are members of the NCCE thus contact information did not exist for all desired survey participants in the NCCE contact database. Therefore, contact information for individual DCE's at programs that were ACAPT members, but not NCCE members, was manually collected by the Centennial Scholar from DCE information included on their program websites.

The survey was disseminated to 220 academic PT programs in June 2021. Survey authors anticipated 30% response rate. Survey participants anonymously entered quantitative and narrative data in the Qualtrics platform. Survey participants had the option to identify their program at the end of the survey. The survey closed in July 2021.

Survey data was downloaded into Excel. Quantitative data was submitted to a qualified statistician with Doctoral training in Applied Statistics. The statistical software R was used to clean and analyze the quantitative data. Descriptive statistics were used to analyze demographic data. Structural equations and other regression models were used to correlate data within the survey. Narrative data was analyzed manually by the Centennial Scholar.

The survey received 112 responses resulting in a 50% response rate. Survey respondents represented a wide range of geographic regions. (Appendix 2, Table 1) Most respondents (93.69%) were Directors of Clinical Education. (Appendix 2, Table 2).

Summary of Findings

Capabilities and Features of CE Data Management Systems

Interviews with CE stakeholders and SaaS vendors and investigation of SaaS websites revealed that CE data management systems serve a broad range of uses. As noted by the PPTF report, there are common third-party CE management platforms used at a cost to academic programs, i.e., SaaS vendors, while other programs may use institutionally developed systems. For the purposes of this capstone project and national survey, a "CE data management system(s)" was defined as any combination of the following: Software as Service (SaaS) programs, e.g., EXXAT, Acadaware, etc., institutionally developed spreadsheets, and on-boarding systems, e.g., Castlebranch. Most systems are designed to support the placement process, as defined by the PPTF. Common uses are included below. (Survey operational definitions for each of the features below are provided in Appendix 1 of this report.)

- Clinical site database
- Required document tracking
- March first Voluntary Uniform Mail Date, i.e., "March Mailer"
- Clinical Education Agreement tracking
- Collection of the APTA Physical Therapy Site Evaluation Form (PTSE) data

- CAPTE reporting
- Student wish list/preference list
- Institution-specific reports
- Student portfolio
- Matching system
- Map links
- Clinical Instructor Continuing Education tracking
- Communication with sites and students
- Tracking of communication
- Collection of APTA Clinical Site Information Form (CSIF)

SaaS vendors advertise the ability to collect, store, and manage CE management data.¹⁵⁻¹⁹ SaaS vendors can be “all-inclusive,” meaning they offer all services related to the placement process, e.g., EXXAT and Acadaware, or they may only offer services related to onboarding, e.g., Castlebranch, Cumplio. In conversations with some third-party vendors, there are wide-ranging opportunities for comprehensive and integrated CE management within these platforms. Some SaaS vendors refer to clinical educators that use the platforms to their fullest capacity as “Super Users.” While not under the purview of this report, SaaS platforms can be used to carry out a width breadth of processes in addition to placement process tasks. These include but are not limited to student performance outcomes and accreditation reporting. Currently, many users may be underutilizing the capacity of their SaaS platforms. SaaS platforms may present an untapped resource for greater data collection related to CE. It is possible that more data, specific to outcomes related to excellence, could be available in the future.

Utilization of existing CE data management systems

Survey data suggested that PT academic programs are using one or more CE management systems for processes related to CE. Many programs are using some version of a SaaS platform to perform tasks related to the placement process, e.g., placement of students, agreement tracking, and onboarding. The SaaS platforms included in this survey are “all-inclusive” of the majority, if not all, operations related to the placement process. The exception was Castlebranch which only offers onboarding support. (See Figure 1 below.)

There were a high percentage of respondents who reported using “Other” systems to complete CE management tasks. This higher number could be attributed to a failure to include additional onboarding SaaS platforms, such as MyClinicalExchange, Cumplio, and Certiphi in the survey structure. Like Castlebranch, these SaaS platforms are used by PT academic programs and clinical sites to manage onboarding of PT students. It is unclear based on the survey data who influences the selection of onboarding software for PT academic programs as this could be determined by the program, the university, or preferences of the clinical sites. Influence by university leadership or requirements of a clinical site could be a limiting factor in an academic program’s ability to engage with a national database management system related to onboarding.

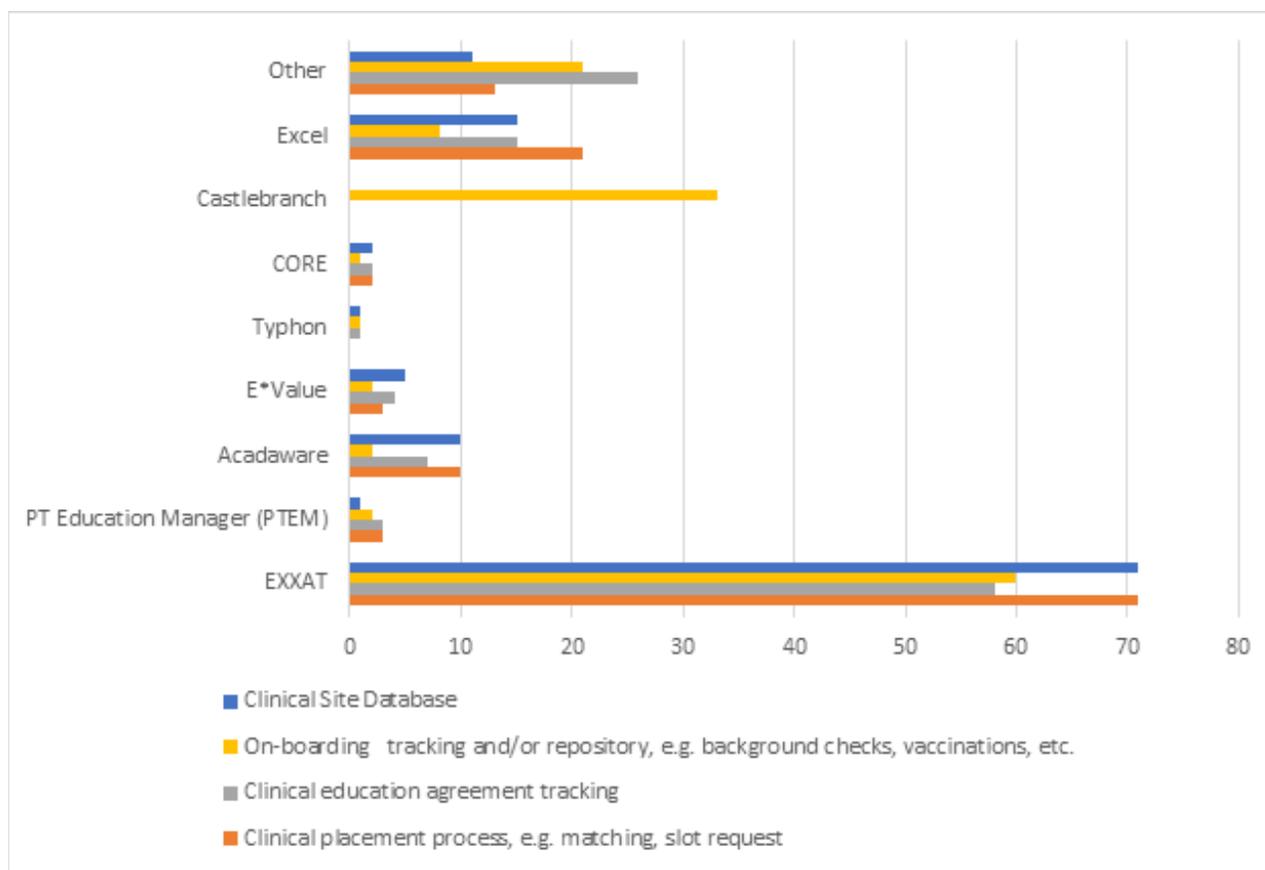


Figure 1 Distribution of operations performed by various clinical education data management systems.

Although SaaS platforms offer services for clinical agreement (or contract) tracking, 23.2% of survey participants reported using “Other” methods for clinical agreement tracking. Some respondents noted that they were obligated to use university-approved systems or oversight by an external department, e.g., university legal office, for the management of clinical contracts. Such university requirements could limit a program’s ability to engage with a national database management system to track clinical agreements (see Appendix 2, Figure 7).

Most respondents use “all-inclusive” third-party SaaS platforms. These third-party vendors offer CE management as a service to a variety of disciplines within healthcare education, e.g., medicine, nursing, speech therapy, occupational therapy, etc. Based on the survey results, the following third-party vendors are most used by PT academic programs: EXXAT (66.6% of respondents), Acadaware (9.1%), eValue (5.5%), and PT Education Manager (5.5%). Survey participants may use SaaS platforms in addition to other systems, e.g., Excel, institutionally developed databases. However, 42.7% are using only 1 system, and, of these, 76% use EXXAT. Respondents also reported higher levels of satisfaction if they used fewer systems (see Appendix 2, Figure 3).

As stated earlier, CE stakeholders use their CE data management systems to perform similar functions, and these patterns of utilization offer additional insight into the type of data that could be mined from these systems. Knowledge of frequently used features offer opportunities to better understand the data

that is housed in these systems. For example, most respondents “always” disseminate the March Mailer through their systems (see Appendix 2, Figure 5). This may facilitate opportunities to learn more about the number of slots offered annually to academic programs.

Finally, the survey inquired about the importance of various features when selecting a CE database system. Survey respondents emphasized the importance of security, Information Technology (IT) and customer support, and initial data transfer and maintenance (see Appendix 2, Figure 6).

Patterns of data collection

The NCCE has expressed a desire to cultivate a national infrastructure for efficient and effective CE communication and resource sharing. Examples of data that the NCCE would like to acquire to advance CE research and data driven decision making include CE capacity for clinical sites; CI quantity and quality, e.g., advanced certifications, credentialing; outcomes assessment tools used by academic program; employment pathway of students; presence of inter-professional or supplemental learning experiences; and demographic data related to the structure of CE.⁶

The survey inquired about the types of data currently housed in CE data management systems. Based on survey responses, academic program CE stakeholders are entering similar data into their CE data management systems that could potentially address the data needs identified by the NCCE and others (see Appendix 2, Tables 5-10). The following lists demonstrate the data most entered into CE data management systems by academic program CE stakeholders in the survey (i.e., $\geq 80\%$ of survey respondents enter the following information into their CE data management systems):

Data entered related to the clinical site:

- Clinic site location
- SCCE contact information
- Clinical education environment, e.g. outpatient orthopedic, acute rehabilitation
- Clinical education agreement/contract information
- Number of placements offered annually

Data entered related to individual clinical experiences:

- Clinical education environment, e.g. outpatient orthopedic, acute rehabilitation, etc.
- Location of clinical sites, e.g., local to program, out-of-area, out-of-state, etc.
- Length of clinical experience
- Type of clinical experience, e.g. first full-time, integrated clinical experience, terminal clinical experience

This survey mostly focused on CE data management systems that are used for the placement process. While many of these “all-inclusive” systems have the capacity to track data related to student performance, e.g. Clinical Internship Evaluation Tool (CIET) in EXXAT, most users are not using these systems for this purpose at this time. Survey respondents also reported using their CE data management systems to extract reports. Most respondents extract CE data required for the CAPTE Annual Accreditation Report (AAR) from these systems, but a high proportion may also extract reports related to placement (or slot) requests or the PTSE (see Appendix 2, Figure 7).

Finally, when considering the data contained in CE data management systems, or any database, and its utility in KDD processes, it is important to understand that analysis may involve looking at the available data for a new purpose and through an expanded lens. When this data is extracted and analyzed with other outcomes of interest, it becomes Big Data and has the potential answer questions and generate new information and insight. The data contained in the APTA PTSE offers an example of this opportunity. 76.0% of respondents have their students complete the APTA's PTSE via their CE data management system. While the purpose of the PTSE is to evaluate the clinic site from the perspective of the student, the PTSE also includes data related to the qualifications and training of the Clinical Instructors (CI), learning opportunities offered at the clinical site, and the students overall feedback related to the quality of the clinical site. The PTSE could be considered as an opportunity to not only serve its intended purpose but also provide as a source of additional data of interest, e.g. CI credentialing, presence of inter-professional learning experiences, etc., that could be extracted from a CE data management system and aggregated with data or outcomes from other systems or sources to answer larger scale hypotheses relevant to PT education.

Recommendations

Recommendation 1

Pause discussions surrounding recommendations for a newly constructed national/centralized CE data management system at this time.

SS: Survey respondents reported agreement with the statement that CE data management systems should serve as a centralized hub for CE outcomes and assessment. There was a relationship between satisfaction and several systems, i.e., higher satisfaction if fewer systems were used. This feedback could be seen as support for a centralized, or national, CE data management system. Previous authors and task forces have recommended a centralized data management system as a solution to the perceived variability across CE data management systems.^{1,2,10,11} A national CE data management system would create an integrated data repository that is more consistent, accurate, and accessible and reduce obstacles to collection of Big Data and educational analytics in physical therapy CE. While a centralized system could be advantageous, it is also important to consider the values and needs of the end user. Survey participants placed high importance on technical support, customer support, and security. Implementation of a national system may still require programs to use additional systems for onboarding requirements of clinical partners or university stipulated systems for contract management.

Survey data suggested variable autonomy of the academic PT programs to select their CE data management system, thus may not be able to participate in a national/centralized data management system. A national system may not guarantee that academic programs will have a centralized hub for all CE data management if they lack autonomy in system selection.

The majority of respondents report satisfaction with their current data management systems. If an alternative, newly constructed system was to be built, it would need to meet or exceed the expectations of systems currently available. As stated by the BPCETF in 2017, consensus and cooperation between stakeholders is required to avoid uncharted disruptions to practice and education.¹ A centralized system would require significant infrastructure and buy-in from CE academic stakeholders who are mostly satisfied with the current state of their data management systems based on the results of this survey.

Recommendation 2

Explore opportunities for data mining within the current landscape of CE data management systems.

SS: To date, there has been little investigation into leveraging existing SaaS and other CE data management systems. The Data and Tech TF suggested in their 2020 report that exemplar SaaS products, e.g., EXXAT, eValue, Acadaware, etc., provide “examples of technology that could be integrated or expanded to capture educational excellence data.”⁶ The PPTF also recommended: “An investigation into the interoperability of data among common platforms may guide efficiencies of the system in the future.”¹¹ While data mining across the large and variable landscape of current CE data management systems presents a daunting task, innovative opportunities to use existing resources should not be overlooked. Based on the findings of this project, several models for leveraging these systems could be explored.

Precedence for extraction of reports from CE data management systems already exists. Programs can build and extract custom reports and submit to external organizations or accrediting bodies. An example of this is supported by a high number of respondents who use their data management system to generate annual accreditation reports and other institution-specific reports. Several SaaS vendors offer the ability to auto-populate the CAPTE AAR within their systems. A consensus-driven, standardized report would improve the quality of data, facilitate data exchange, and improve communication. Initial inquiry with one SaaS provided confirmed the addition of such a template to their system would be technologically feasible. Currently, vendors are not able to share data without explicit permission from the programs. Any collection of data would require collaboration with vendors and stakeholders.

Targeted data extraction from one or more system(s) for specific data sets could offer another model. This type of data mining has occurred on a smaller scale in CE research. As part of his PhD dissertation, Dr. Sean Gallivan, PT, PhD, and DCE at the University of Dayton, conducted a research study with data from 29 academic programs to assess the reliability and validity of the PTSE. He obtained permission from the universities and collaborated with a SaaS vendor to extract the PTSE data from their database. Other researchers across the clinical education in healthcare education have conducted similar studies in collaboration with SaaS providers.⁸

Data extraction could also occur via partnerships with one or more SaaS vendors. Survey data suggested that 66.6% of respondents are using the same SaaS third-party vendor. The high user base of a single vendor could serve as a proxy for a centralized database. Those programs that did not want or could not switch to that vendor as their primary CE data management system could subscribe to participate in ACAPT data collection processes for a smaller, nominal fee. Data would be housed and managed by one provider while allowing programs to maintain autonomy with their preferred CE data management systems. The Texas Consortium of Physical Therapy Clinical Education, Inc. offers an example of this model. Texas PT programs administer the PT Manual for the Assessment of Clinical Skills (PT MACS) through a SaaS vendor. Non-subscribing programs can still access the PT MACS separately by paying a nominal fee. Challenges of this model include a potential increase in the number of systems with which a program would have to interface if they were not a user of the participating SaaS vendor which is counter to the preferences of respondents of this survey. Additionally, contracting with a singular SaaS vendor may have other unforeseen challenges.

Recommendation 3

Collaborate with key stakeholders in CE data management, i.e., PT stakeholders and CE management vendors, to identify sustainable and standardized methods to capture, store, and analyze data that minimizes data collection burden to CE faculty.

SS: In general, heterogeneity of software and systems that hold data and organizational policies related to security and confidentiality are critical barriers that need to be overcome to support the use of Big Data and analytics in HPE.⁹ Close collaboration between PT education stakeholders and technical partners will offer important insight into next steps for integration of Big Data techniques in PT education. Examples of such collaboration already exist in medical education through the development of consensus and stakeholder driven technical standards, i.e., AAMC's MedBiquitous consortium.^{20,21} While the work of this capstone project suggests opportunity exists within the landscape of CE data management, significant collaboration between stakeholders and custodians of the data, i.e., SaaS vendors, will need to occur to successfully leverage of existing systems. Also, this next step should consider and emphasize strategies to minimize the data collection and submission burden on CE faculty and administrators.

Next steps should also consider potential barriers to successful execution of Big Data and analytics that includes CE data management systems. Continued emphasis to establish common terminology related to CE and PT education in general will be helpful to improve the fidelity of data mining. An example of this would be common terminology for types of clinical environment, e.g., acute rehabilitation versus inpatient rehabilitation. Challenges related to common terminology have been reported in the work of previous professional task forces.^{2,6,11}

Currently, information from CE data management systems could potentially be linked to a specific institution. However, vendors are unable to share data without explicit permission from the programs. This would need to be addressed to allow parallel capture of data across different institutions. In addition, there is not a mechanism to collect data at the level of the individual. Unique numerical identifiers for students, faculty, and clinical instructors could maximize opportunities for data mining in CE data management systems and other data sources. Need for individualized data to answer focused questions in PT education is in congruence with challenges highlighted by the Task Force to Explore Data and Technology and other groups in medical education.^{6,22}

Recommendation 4

Convene key stakeholders to identify the most relevant data within CE data management systems that is desired to inform KDD of PT education.

SS: Academic program CE stakeholders are entering similar data into their CE data management systems that could potentially address the data needs identified by the NCCE and other stakeholder groups. In order to support the needs of CE stakeholders and support ACAPT benchmarking efforts, outreach to *all* stakeholders to identify specific data desired from these systems and to formulate processes to aggregate data from multiple sources is required to offer meaningful answers to challenges faced by CE and PT education in general.

Recommendation 5

Continue to actively promote a culture of shared data.

SS: Any model to conduct data mining with the current landscape of CE data management will require stakeholder buy-in. CE stakeholders will need to see value in shared data to facilitate meaningful participation. It should be noted that, based on survey data, academic program CE stakeholders are almost exclusively using data from their CE data management systems to make decisions regarding the placement process and CE at the programmatic level. Very few survey respondents indicated that they are using this data for strategic planning and external benchmarking at this time. The wealth of CE information contained in these systems represents an opportunity to expand upon the application and utilization of this data. CE data gathered from CE data management systems could be aggregated with other data housed within the ACAPT Center for Excellence, thus supporting Big Data in PT education. For example, the ACAPT Center for Excellence could examine trends between CE data, e.g., length, type, and setting of clinical experiences, and Carnegie classification, program size, or curricular model. ACAPT will need to continue to actively promote a culture of shared data to achieve successful data collection within the current landscape of CE data management, regardless of the model adopted. This includes calculated and targeted marketing efforts to CE stakeholders regarding the direct relevance and value of Big Data in CE. These efforts are necessary to optimize participation. Trusted CE communication networks would be a useful mechanism for grassroots marketing and training.^{23,24}

Recommendation 6

Investigate the impact of CE data management platforms on all clinical education stakeholders.

SS: It is important to note that the objective of this capstone project only investigated stakeholder feedback from PT academic programs. Students and clinical partners, e.g., SCCE and CI's, also interface with CE data management systems. Clinical partners often manage more than just PT student placement processes. Their job duties may include placement processes for other healthcare education programs. As noted by the PPTF, SCCE's manage many different communications and systems used by their various academic clinical partners as well as institutionally specific symptoms, e.g., onboarding database for the healthcare system.¹⁰ Additional research related to the experience and challenges facing our clinical partners in CE data management would be beneficial to foster true academic-clinical partnerships. This demand for true clinical-academic partnerships has been echoed by many including the recommendations of the 2014 Clinical Education Summit², Jette⁴, Jensen^{3,25}, and the recently published Vision for Excellence in PT Education.⁵ Acknowledgement of the SCCE as an educational leader requires they be integrated into decisions related to CE data management.

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Appendix 1

Survey Operational Definitions

Survey operational definitions for features within clinical education data management systems. Survey respondents indicated on a Likert scale how frequently they used each of these features.

Term	Definition
Clinical site database	Data entry of contracts, student clinical experiences. Tracking of clinical instructor and site information.
Required document tracking	Tracking, requesting, and/or uploading of on-boarding documentation.
Institution-specific reports	Generation of reports to support program curriculum.
APTA Clinical Site Information Form (CSIF)	CSIF data is stored in system.
March Mailer	Annual solicitation from academic program/consortia to clinical sites with clinical placement requests for the following calendar year.
Matching system	System algorithm organizes matching process for clinical experiences.
Student wish/preference list	Students enter site preference information that integrates with system matching system.
Clinical education agreement tracking	Track agreement/contract status and expiration dates through system.
Common clinical agreement sharing	Tracking of agreement/contracts shared by multiple allied health programs, e.g. PT, OT, RN, etc., within a single institution.
Communication with clinical education sites	Academic institution communicates with clinical partners through the system.
Communication with students	Academic institution communicates with students regarding clinical experiences through the system.
Communication logging	Notes related to student experience logged into system.
Physical Therapy Site Evaluation (PTSE)	Students enter PTSE data via student-facing portal.
CAPTE reporting	CAPTE data for Annual Accreditation report is generated by the system.
Map links	Geographical overview of clinic sites, e.g., students able to map distance between home and site.
Student portfolio	Students manage their professional profiles via the student-facing portal. Profiles are available for clinic sites or can be exported to prospective employers.
Clinical Instructor continuing education units	Auto-generation of the CI certificate upon completion.

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