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Investigating the Integration of Diagnostic and Procedural Imaging Into DPT Clinical Education Experiences

■ **OBJECTIVE:** To describe the integration of diagnostic and procedural imaging into Doctor of Physical Therapy (DPT) students' terminal clinical education experiences.

■ **DESIGN:** Descriptive survey

■ **METHODS:** A web-based survey was distributed to clinical instructors (CIs) in 11 jurisdictions in which physical therapists (PTs) have imaging referral privileges. Survey questions investigated the CIs' imaging referral beliefs and practices, along with interactions with students regarding imaging findings being incorporated into clinical decision making.

■ **RESULTS:** Of 132 responding CIs, 29% were unsure or responded negatively about having jurisdictional imaging referral privileges. Additionally, 28% of CIs stated referring for imaging was beyond their personal scopes of practice. Another 31% of those not engaging students with imaging discussions expressed imaging referral and acting on results were not entry-level skills, with 27% citing inadequate student academic preparation. Clinical instructors identified barriers to integration of imaging into clinical education experiences including employer policies, concerns for offending referral sources, lack of CI confidence/training, and lack of communication from academic programs regarding student preparation.

■ **CONCLUSION:** Interactions between CIs and students were highly varied with many students having limited imaging-related experiences. Multiple opportunities exist to enhance clinical education experiences related to imaging to better prepare DPT students for licensure examination and contemporary clinical practice. *JOSPT Open 2026;4(3):289-296. Epub 4 May 2026. doi:10.2519/josptopen.2026.0207*

■ **KEY WORDS:** *clinical instruction, DPT education, entry-level education, imaging referral*

Numerous examples exist highlighting diagnostic imaging as part of entry-level physical therapist education. The Commission on Accreditation in Physical Therapy Education (CAPTE) accreditation standards include imaging as an element of expected professional curriculum content and learning experiences necessary to prepare students for entry-level practice.[8] The American Physical Therapy Association (APTA) report titled, "Competency-Based Education in Physical Therapy: Essential Outcomes for Physical Therapist Entrance Into Practice (CBEPT)," defines expectations for entry-level performance, including the interpretation of imaging studies' results.[1] Further, the Federation of State Boards of Physical Therapy (FSBPT) describes the potential for imaging-related concepts on the licensure examination.[10] As such, student preparation for successfully integrating imaging into clinical practice is critical.

Imaging curricular standards set by CAPTE and the inclusion of imaging content in the licensure examination by FSBPT reflect increasing numbers of US jurisdictions allowing imaging referral privileges for physical therapists (PTs). Seventeen jurisdictions (**SUPPLEMENTAL APPENDIX A**) have language explicitly stating PTs have such privileges (November 2025), up from 11 jurisdictions in September 2023 (B. Steiner, email communication, November 26, 2025). This number will likely continue to increase as numerous jurisdictions are actively pursuing similar legislation (B. Steiner, email communication, November 26, 2025). Some jurisdictions have practitioner qualification language in terms of who within the profession can refer patients for imaging, and holding a DPT degree is one of the qualifications listed.[20–22] This again highlights the importance of DPT program graduates' preparation for integrating imaging into clinical practice.

A recent survey of academicians in DPT curricula included their assessment of students' abilities of properly using consensus-derived guidelines for imaging referral. Radiography referral was estimated at 82% being capable, magnetic resonance imaging (MRI) at 63%, computed tomography (CT) at 59%, ultrasound at 45% and bone scan at 42%. The academicians also rated student competence of using the referral guidelines on a Likert scale of 1 being not competent and 5 being competent. Student competencies of the commonly used imaging modalities were estimated at radiographs at 4.2, MRI at 3.7, CT and ultrasound at 3.6, and bone scan at 3.3 and student clinical education experiences were reported by faculty to be the most valuable strategy to advance student competencies.[13]

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Faculty citing increased clinical education experiences as the most beneficial strategy to enhance student competence is not unique to diagnostic imaging. Boissonnault et al[5] and Young et al[23] reported similar faculty expectations for enhancing joint manipulation and medical screening student competence, respectively. Subsequent surveys of CIs revealed wide and inconsistent variations regarding CI experiences and beliefs related to joint manipulation and medical screening.[4,24] These findings, along with the fact that no data exist describing to what degree imaging is currently integrated into clinical education experiences, suggest that the expectation that imaging integration occurs during terminal clinical education experiences may be an unfounded assumption.

Therefore, the study's purpose was to investigate the integration of imaging into DPT students' clinical education experiences. The survey research included investigation of the availability of such clinical education opportunities, the scope of the provided imaging training, and the imaging experience of clinical instructors (CIs) working with students in states that allow PTs to refer patients directly for imaging. Survey results may serve as a benchmark for academic and clinical education faculty to assess current clinical education imaging opportunities, and as a guide for developing appropriate student and CI imaging training programs including the identification of important resource materials.

METHODS

A survey, using REDCap (Research Electronic Data Capture),[11,12] was constructed seeking CIs' demographic information, their integration of imaging in clinical practice and into student interactions, and their perceptions of student competency with imaging-related clinical decisions. REDCap Branching Logic was used for adaptive questioning scenarios. The draft survey

TABLE 1
Description of Survey Respondents

Demographic Category	Frequency
Clinical Degrees Achieved (n, %)[a]	
DPT/tDPT	104, 81%
Master's	16, 13%
Bachelor's	8, 6%
Years as licensed PT (mean, min-max)	16.2, 1-47
Years as CI (mean, min-max)	12.7, 2-37
Education programs as CI (mean, min-max)	3.3, 1-10
APTA-credentialed clinical instructor (n, %)	79, 60%
Years as APTA-credentialed clinical instructor (n, %)[b]	
0-4	21, 27%
5-9	22, 28%
10-20	31, 39%
More than 20	5, 6%
Students as CI in the past 5 years (n, %)[c]	
1-5	78, 60%
6-10	31, 24%
11-20	13, 10%
>20	8, 6%
Professional association memberships (n, %)[d]	Yes: 83, 63%
APTA	79, 95%
Academy of Orthopaedic Physical Therapy/APTA Orthopaedics	39, 47%
American Academy of Orthopaedic Manual Physical Therapists	18, 22%
Academy of Sports Physical Therapy	9, 11%
APTA Geriatrics	6, 7%
Imaging Special Interest Group	5, 6%
Primary focus of practice (n, %)[e]	
Musculoskeletal/outpatient	110, 89%
Sports	27, 22%
Neurological	13, 11%
Pelvic health	11, 9%
Pediatrics	4, 3%
Hand/upper extremity	3, 2%
Completion of accredited residency (n, %)[f]	Yes: 13, 11%; No: 111, 90%
Orthopaedics	10, 77%
Sports	3, 23%
Completion of accredited fellowship	6, 5%
Other imaging referral experience	6, 5%
States of primary practice[g] (n, %)	
Arizona	0, 0%
Colorado	21, 18%
District of Columbia	2, 2%
Iowa	13, 11%

(Table continues on next page.)

TABLE 1
Description of Survey Respondents (continued)

Demographic Category	Frequency
Maryland	2, 2%
New Jersey	5, 4%
North Dakota	9, 8%
Rhode Island	0, 0%
Utah	2, 2%
West Virginia	5, 4%
Wisconsin	60, 50%

Abbreviations: APTA, American Physical Therapy Association; CI, clinical instructor; DPT, Doctor of Physical Therapy; PT, physical therapist; tDPT, Transitional Doctor of Physical Therapy.
[a]Missing data for 4 participants.
[b]Missing data for 1 participant.
[c]Missing data for 2 participants.
[d]"No" implied by absence of response; missing data not identifiable.
[e]Missing data for 8 participants.
[f]Missing data for 8 participants
[g]Missing data for 13 participants.

was reviewed by 5 content experts (PTs) with extensive imaging clinical and educational experiences. The feedback provided on survey content and functionality resulted in minor survey refinements. The study was approved by the University of Kentucky Institutional Review Board (IRB 100663).

Eleven US jurisdictions were identified where PTs had been granted imaging referral privileges for a minimum duration of 2 years to allow adequate time for integration of imaging referral privileges into daily practice and into student clinical education experiences. The 44 DPT CAPTE-accredited institutions in those 11 jurisdictions were contacted, requesting survey distribution to their CIs, involved in students' "full-time terminal clinical education experiences." The communications to DPT education programs were initiated on January 27, 2025, with subsequent survey invitations to CIs being distributed directly through known large health care systems and private practice groups and members of the Imaging Special Interest Group in the same jurisdictions. Upon access to enter the survey, informed consent for participation or the choice not to participate was presented. No personal identifiable information was sought. Survey participation was not incentivized. Data collection closed on July 31, 2025, after which records were analyzed for duplicate data, with none identified. The duration of the survey's availability resulted from multiple recruitment approaches to maximize participation along with specific periods of programs electing to contact CIs during lower demand intervals.

Analyses were by proportions and simple descriptive statistics, and Likert scale values were noted as continuous data.

RESULTS

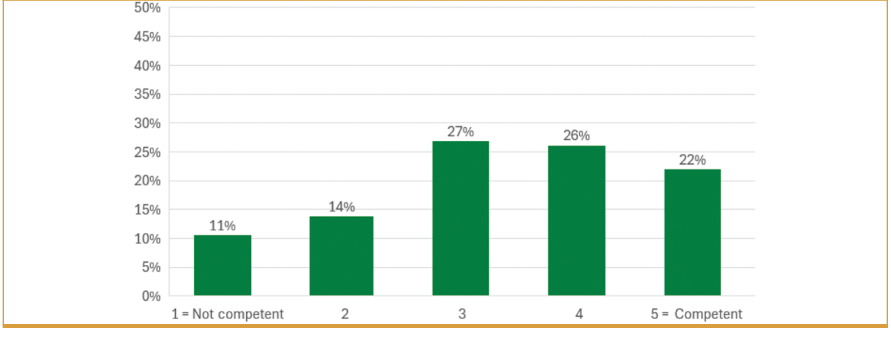
Of the 153 respondents opening the survey, 132 submitted data, including 120 complete data sets. The smallest number of responses to general questions available to all and not dependent on prior questions was 108. **TABLE 1** provides demographic and other self-descriptive respondent data. A total of 72% (88/123) of respondents indicated that their jurisdiction allowed PTs to refer patients directly for radiography, while 15% (19/123) of respondents were unsure and 13% (16/123) responded negatively about the existence of such privileges in jurisdictions with known referral privileges. Responding to whether employers had policies on direct imaging referral by PTs, 29% (n = 35/123) responded affirmatively, 46% (n = 56/123) indicated no such policy, and 26% (n = 32/123) were unsure. Among those responding that their employers had such policies, 40% (n = 14/35) indicated a prohibition on direct referral and 6% (n = 2/35) were unsure.

FIGURE 1 demonstrates the distribution of CIs rating their own competence to refer patients directly for imaging with a mean of 3.35 on a scale of 1 to 5 (5 = competent; 1 = not competent).

CIs' Integration of Imaging Into Clinical Practice

A large proportion of 92% (n = 110/120) of CIs described referring 0% to 5% of

FIGURE 1
Clinical instructor self-rated competence for direct imaging referral.



their patients directly for imaging and 8% (n = 9/120) referring 6% to 20% of their patients. Indirect referral for imaging (through another provider) was noted by 48% (n = 58/122) of respondents for 6% to 20% of their patients and by 39% (n = 47/122) for 0% to 5% of patients.

A minority of 40% (n = 49/122) of responders noted that imaging results influenced clinical decision making in approximately 6% to 20% of patients followed by 21% (n = 25/122) for 0% to 5% of patients, 15% (n = 18/122) for 41% to 60% of their patients, and 2% (n = 2/122) for more than 60% of their patients.

Reasons respondents did not refer patients for imaging included concerns for reimbursement (29%; n = 34/118), limited personal scope of practice (28%; n = 33/118), concerns for offending physician referral sources (24%; n = 28/118), lack of confidence/training (21%; n = 25/118), not permissible by practice act or regulations (20%; n = 24/118), and ease of referral completion through physician referral sources (18%; n = 21/118). **TABLE 2** details these barriers to PTs referring for imaging.

Potential negative impact on patient care due to PTs' lack of direct imaging referral was cited by 30% (n = 35/118) in 6% to 20% of their patients followed by 5% (n = 6/118) in 21% to 40% of patients.

CI and DPT Student Interactions

Regarding overall frequency of CI and student interactions about imaging and the proportions of patients in which those dialogues occur, 41% (n = 49/120) reported discussions on referral for imaging in 6% to 20% of patients and 38% (n = 45/120) had discussions about imaging referral in 0% to 5% of patients. Regarding results of imaging influencing subsequent patient management decisions, 33% (n = 39/118) of CIs reported having discussions with students in 6% to 20% of patients and 21% (n = 25/118) of CIs reported discussing with students 21% to 40% of patients. For integrating imaging results into patient education discussions, the frequency proportions were more evenly distributed with 28% (n = 33/119) in 6% to 20% of patients, 22% (n = 26/119) in more than 60%, 19% (n = 23/119) in 21% to 40% of patients, 18% (n = 21/119) in 41% to 60% of patients, and 13% (n = 16/119) in 0% to 5% of patients.

When those discussions between CIs and students occurred, the topics within those discussions were focused on relevance to clinical context (92%; n = 108/117), indications or lack thereof for imaging (89%; n = 104/117), effect on patient management decisions (81%, n = 95/117), development/modification of prognosis (77%; n = 90/117), anatomical variants (76%; n = 89/117), communication with other providers (68%; n = 79/117), and lifespan changes (58%; n = 68/117). Reasons CIs did not engage with students regarding imaging included inadequate time to access the images and radiology reports (38%; n = 18/48), imaging was outside of personal scopes of practice (33%; n = 16/48), and students not being adequately prepared with imaging (27%; n = 13/48). Notably, 31% (37/120) of respondents believed imaging referral and acting on those results were not entry-level skills. Adequate information on student preparation with imaging was reported by 20% (n = 23/117) of CIs, while 80% (n = 94/117) reported adequate information was not provided.

Regarding frequency of accessing and discussing radiologists' reports and images with students, 49% (n = 58/119) reported doing so in less than 20% of patients, 27% (n = 32/119) in 20% to 40% of patients, 10% (n = 12/119) in 40% to

TABLE 2
Barriers to Imaging Integration in PT Clinical Education With Potential Solutions

Barriers to Imaging in Clinical Education	Frequency	Potential Solutions & Primary Facilitator(s)
CI lack of knowledge of student preparation	80%	DPT program dissemination to CIs of imaging-related preparation for students
Lack of use of consensus derived imaging guidelines (ACR Appropriateness Criteria)	65%	State association education for practitioners; DPT educational program emphasis for students; DPT program educational programming for CIs
CI employer policy prohibitive where policy existent	40%	CIs educating employers of the benefit to medical providers of PTs having imaging referral privileges
CI perception of imaging referral as not an entry-level skill	31%	State association education for practitioners; DPT program educational programming for CIs
Concerns for reimbursement	29%	Determine if valid; CI familiarity with ACR Appropriateness Criteria to determine medical necessity
CI lack of knowledge of jurisdictional scope or practice	29%	CI engagement with state association and awareness of state regulatory board rulings/opinions; state association and DPT program education of members and CIs
CI lack of personal scope of practice	28%	State association education for practitioners; DPT program educational programming for CIs
Students not adequately prepared academically as reason not included in clinical education	27%	DPT program instruction consistent with recommendations
Concerns for offending physician referral sources	24%	CIs educating referral sources of the benefit to medical providers of PTs having imaging referral privileges
CI lack of confidence/training	21%	Familiarity with ACR Appropriateness Criteria; seeking educational opportunities from state association and other established resources, including Imaging Special Interest Group

Abbreviations: ACR, American College of Radiology; CI, clinical instructor; DPT, Doctor of Physical Therapy; PTs, physical therapists.

60% of patients, 6% (n = 7/119) in 60% to 80% of patients, and 8% (n = 10/119) in 80% to 100% of patients.

Resources accessed most frequently by CIs during student interactions included JOSPT Cases (46%, n = 33/72), American College of Radiology Appropriateness Criteria® (35%, n = 25/72), JOSPT MSK Imaging Feature (28%; n = 20/72), *Fundamentals of Musculoskeletal Imaging* by McKinnis (25%, n = 18/72), and radiopaedia.org (19%, n = 14/72).

DISCUSSION

This investigation of imaging integration into students' clinical education experiences was driven by DPT academic faculty citing such experiences as the most beneficial strategy to enhance student competency beyond classroom and laboratory instruction,[13] an assumption based on little data. Our results suggest inconsistencies to which imaging is integrated into clinical education student experiences, both in frequency and in depth, including the report that 33% of CIs do not engage students regarding imaging. Among CIs responding affirmatively to integrating imaging into their interactions, 78% reported discussing imaging referral with students in 20% or less of their patients. While there is no standardized goal or optimal numerical discussion points related to imaging referral, the value of considering the absence of indications for imaging referral is equally important to recognizing when imaging is indicated. The overuse of imaging by medical providers with associated negative consequences[7,9,14,16] underscores why students must understand prudent patient referral for imaging consistent with consensus-derived guidelines.

Imaging relevance to clinical practice extends beyond indications for patient referral. **FIGURE 2** summarizes imaging content discussion topics and the total frequencies of student and CI engagements. Relevance to clinical context (92%), indications or lack thereof for imaging (89%), impact on patient management decisions (81%), and influence on patient prognosis development (77%) were discussed with greatest frequencies, all of which are critical elements for students to better understand. While acknowledging the indications for imaging referral or their absence, and the other potential scenarios imaging findings may influence clinical decision making may differ across patient populations and clinical settings, these topic areas are nonetheless essential to students understanding how and when imaging should be integrated into clinical practice. Again, while no reference of optimal frequency exists for these discussions, routine consideration during student and CI engagements is the essential issue.

Respondents noted multiple obstacles to integrating imaging into clinical practice and into student clinical education experiences. That 29% of respondents were unsure or believed direct patient referral for radiography was not permissible highlights lack of awareness of jurisdictional scope of practice and is consistent with prior published data. Mabry et al[18] reported that only 42% of PTs practicing in states that allow imaging referral were aware of this privilege. Additionally, 31% of CIs reported the belief that imaging referral and acting upon the referral were not entry-level skills.

FIGURE 2
Clinical instructor and student topics if engaging in discussion of imaging.

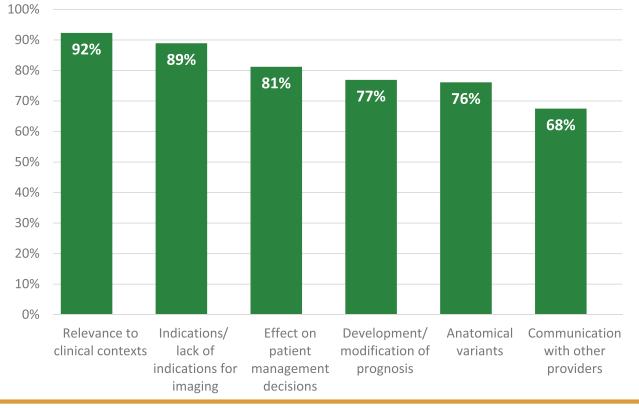
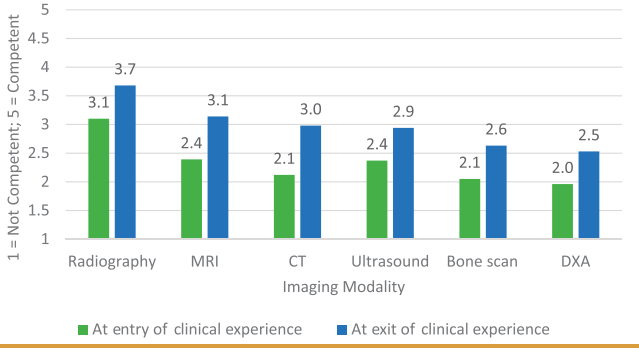


FIGURE 3
Clinical instructor perception of student competence for imaging referral. Abbreviations: CT, computed tomography; DXA, dual-energy x-ray absorptiometry; MRI, magnetic resonance imaging.



Lack of communication by educational programs may contribute to this opinion. Over 80% of CIs reported not receiving sufficient information from the educational programs on student preparation with imaging content.

Several other obstacles were reported, potentially influencing student engagement such as 21% of respondents expressing a lack of confidence or training related to directly referring patient for imaging. The practitioner self-rating referral competency at 3.35 reflects mid-range knowledge and skill value. Respondents also reported concerns of lack of reimbursement (29%) and potentially offending referral sources (24%) as barriers. Lastly, 40% of respondents working for employers with existing policies for imaging referral by PTs reported those policies as being prohibitive.

Barriers beyond jurisdictional legal authority to PTs referring for imaging have been reported anecdotally in hospital-based settings.[3,17] Schumacher et al[19] surveyed PTs practicing in North Dakota, one of the jurisdictions allowing patient referral for imaging by PTs, and reported concerns regarding provider work relationships being compromised, internal policies limiting those with imaging referral privileges, and lack of entry-level training as barriers. These combined barriers commensurately serve to limit student and CI engagement related to imaging.

FIGURE 3 describes CI assessment of student ability to refer for imaging at the beginning and conclusion of terminal clinical education experiences. These values reflect favorable trends in student knowledge of imaging referrals during clinical experiences. Despite this trend, the fact that many respondents did not assess students' competencies on their ability to refer patients directly for radiography (23%) and MRI (29%) illustrates the recurring theme of inconsistency and unfulfilled educational opportunities.

Assessing student competency can be done through the Clinical Performance Instrument 3.0,[6] a standard set of CI assessment criteria for students. This tool repeatedly references using and interpreting objective data, tests, and measures for patient examination contributing to the differential diagnosis process.

In 2021, the American Council of Academic Physical Therapy (ACAPT) of the APTA and the APTA Academy of Education published a report titled, "A Vision for Excellence in Physical Therapy Education: Culmination of the Work of the Education Leadership Partnership."[2] This report highlighted how important academic-clinical partnerships were to achieve this vision and numerous recommendations were provided to strengthen this partnership. The variable and inconsistent results from our study identify imaging as a content area where opportunities exist to apply these recommendations.

DPT educational programs are well positioned to create positive momentum for students being appropriately prepared to integrate imaging into clinical practice, beyond classroom instruction.[15] Communicating student exposure and preparation to CIs, along with outcome expectations during clinical education experiences, can contribute to a learning environment that promotes growth for CIs and students. Providing clinical sites with (1) relevant practice act information and (2) imaging language contained in the CAPTE criteria, the FSBPT Model Practice Act, and APTA's Competency-Based Education (CBEPT) report will highlight the profession's commitment to integrating imaging into entry-level education and routine clinical practice.

In the recent APTA CBEPT report, item 6 of the Patient and Client Care and Services domain reads "Interprets laboratory data, imaging studies, and other tests required for the area of practice."[1] This specifies the interpretation of imaging studies results as an expected entry-level practice skill as it relates to the Patient and Client Management Model per the Guide to Physical Therapist Practice. With the FSBPT national licensure examination including imaging content and those outcomes reflecting directly on educational programs, addressing these issues would appear to be a logical investment for educators. To promote integration of imaging into student clinical education experiences, a list of valuable imaging resources for educational programs, CIs, and professional associations is provided as **SUPPLEMENTAL APPENDIX B.** Becoming more familiar with the American College of Radiology Appropriateness Criteria® as the single most valuable tool for imaging decision making would be a major step toward CIs having broader personal scopes of practice consistent with their jurisdictional scopes of practice. By expanding educational outreach efforts by DPT programs and APTA and its components, the confidence, experience, and knowledge gaps revealed in this survey and that of Schumacher et al[19] can be addressed.

Limitations of our study include disproportionate CI representation in the jurisdictions surveyed. Survey response rate calculation is not possible because the number of CIs in the 11 jurisdictions is unknown. The study's methodological approach required contacting CIs indirectly through educational programs or other entities. Similar to previous publications related to clinical education,[4,24] we presume the response rate to be relatively low. Nonetheless, despite the modest participation level, our study highlights key issues not previously reported regarding the integration of imaging in DPT clinical education and student preparation for entry-level practice.

CONCLUSION

We observed wide variations in CI beliefs and practices related to imaging and to the subsequent

student clinical education imaging experiences. The results describe multiple factors relevant to the wide variation. For faculty expectations regarding students' increased abilities to competently integrate imaging into clinical practice to be met during their clinical education experiences, there is a need for a multifactorial approach. This would include DPT programs working more closely with their clinical partners and national organizations to address the gaps. Such an approach provides the best opportunity for provision of consistent and higher-quality imaging learning experiences for students, thereby promoting better student preparation for the licensure examination and contemporary practice upon graduation. ■

KEY POINTS

FINDINGS: The inclusion and extent of imaging in physical therapist student terminal clinical education appear to be widely variable.

IMPLICATIONS: Numerous opportunities exist to address the various contributing factors associated with the inconsistency of integration imaging in clinical education, which will require a broad-based approach acting on the many educational opportunities.

CAUTION: Our survey had modest participation, although the results allowed us to report on imaging-related clinical education issues not previously identified.

STUDY DETAILS

AUTHOR CONTRIBUTIONS: Conceptualization and content of survey instrument, interpretation of data, writing of manuscript, and overall project administration: Charles R. Hazle, Jr, PT, PhD; and William G. Boissonnault, PT, DPT, DHSc. Survey instrument construction, distribution, administration, and compilation of data: Jaxon Keeton, BS; Calvert Benson, BS; and Noah Taylor, BS.

DATA SHARING: Data are available upon request.

PATIENT AND PUBLIC INVOLVEMENT: Patients and the public were not involved.

USE OF GENERATIVE AI: Artificial intelligence tools were used to assist with editing and improving the clarity of the manuscript only. All intellectual content, analysis, and conclusions are the authors' own.

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