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ORIGINAL RESEARCH

Trends in Doctoral Education Among Healthcare Professions: An Integrative Research Review

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Context: Evidence suggests widespread adoption of the entry-level doctorate among health professions, although little is known about how these changes have impacted associated professions and influenced education, collaborative practice, professional advancement, or professional salaries.

Objective: Threefold: (1) What doctoral education models are currently utilized among health care professional education programs in the United States? (2) How do entry-level clinical doctorates in health care professions impact research training and productivity? (3) How do clinical doctorates among health professions influence practice opportunities and salary?

Design: Data were extracted from various sources including professional organizations, accrediting body Web sites, and the US Department of Labor database. Full-text articles published in English between the years 2001–2011 were extracted from a search of 38 databases in the University of Washington libraries. The remaining article abstracts were reviewed for compatibility with our research questions. Data were extracted using a standardized rubric and coded according to emergent themes.

Results: Two-thirds of 14 examined health professions ($n = 10$) followed the medical model of postbaccalaureate entry-to-practice professional doctoral education. Less than a third ($n = 4$) of surveyed professions reserved doctoral-level education for advanced practice, and 1 profession maintains both entry-level and advanced practice doctorates. Only 4 of the 14 clinical doctoral degrees required completion of an original research project. Entry-level clinical doctorates may provide insufficient specialty training, necessitating further training after graduation.

Conclusions: Most health care professions follow the medical model for professional preparation, though at reduced intensity with fewer clinical hours than physician training. Clinical doctorates are perceived to increase professional opportunities and are associated with higher salaries and doctoral education among health care professions has become the new educational standard, though research training, research productivity, diversity, and professional debt burden have been negatively impacted by this trend.

Key Words: Curriculum, clinical doctorate, professional training

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Trends in Doctoral Education Among Healthcare Professions: An Integrative Research Review

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INTRODUCTION

Recent proliferation of clinical doctoral degrees among health professions has created conversations on educational and professional practice models, quality of professional education, independent practice opportunities, and future directions.[1] Doctoral education with the accompanying title of doctor was never reserved solely for physicians as the Latin root of the word doctor means "to teach". In fact, the first doctors lectured on finer points of law, philosophy, or the state of man's soul to become a doctor of law, a doctor of philosophy, or a doctor of divinity in order to teach at institutions of higher learning.[1–3]

The Medical School of Salerno established the first medical doctorate during the 13th century with a 5-year curriculum and 1 year of supervised practice.[3] Columbia University granted the first North American medical doctorate in 1767, with Harvard University transitioning from a bachelor of medicine to a doctor of medicine degree in the 1800s.[2–5] This medical education model persists with slight variations, but generally requires at least 3 years of baccalaureate-level basic science and liberal arts prerequisites, 4 years of entry-level medical training (2 years of didactic courses and 2 years of clinical experiences), and 1 to 5 years of graduate-level residency training, interspersed with required standardized examinations at each step of the process.[5,6]

As medical knowledge expanded and unmet patient needs were identified, specialty practice areas developed[7] and new health professions were born.[8] With each profession identifying its knowledge base and scope of practice, the need for practice standards and focused educational programs became apparent.[7] Professional maturation led to further curricular and knowledge expansion culminating in the adoption of a doctoral degree as requisite for professional entry.[8]

Doctoral degrees are generally categorized as entry-to-practice professional degrees (AuD, DDS, DO, DPM, DPT, MD, OD, OTD, PharmD), postprofessional advanced practice degrees (DNP), or postmaster's academic degrees (EdD, PhD) with either practical (EdD) or theoretical (PhD) emphases. Although professional education was once closely tied to academic degrees, a steady move away from the academic model to a professional education model has occurred.[3,8,9] The shift to a professional education model may impact health professions on a variety of levels (eg, salary, public recognition, scope of practice, debt burden, research productivity). Recent discussions in athletic training have focused on determining the best entry-level educational model (ie, baccalaureate, entry-level masters, entry-level doctoral), and the role of doctoral and postprofessional clinical training (eg, residencies and specialty certifications).[10–12]

Despite the many professional doctoral programs in existence, differences in curricular approach, educational and professional impact of clinical doctorates, and the relationship between doctoral education and practice opportunities remain poorly understood. Thus, our purpose was to conduct an integrative research review and comparative analysis of doctoral education among health professions to further explore these issues. Our study was guided by the following research questions: What doctoral education models are currently utilized among health care professional education programs in the United States? How do entry-level clinical doctorates in health care professions impact postprofessional training, productivity, and practice opportunities? How do clinical doctorates among health professions influence salary?

METHODS

Data on professional accrediting standards, admission requirements, and doctoral curricular standards were extracted from professional organization and accrediting body Web sites (Table 1) to assess and categorize the professional educational model and provide data for curricular features listed in Table 2. Income data for various health professions was extracted from the US Department of Labor database and are summarized in Tables 3 and 4. A search of 38 databases in the University of Washington libraries including WorldCat, ERIC, ArticleFirst, MEDLINE, BioMed Central, ScienceDirect, and Academic Search Complete for "clinical doctorate" yielded 272 results, primarily editorial in nature. A second search using the keywords "health care professional doctoral education" yielded 39 results. All search results were limited to full-text articles published in English between the years 2001–2011. Articles related to gender studies, minority representation, student success prediction modeling, learning styles, management, educational leadership, continuing education, social work, business management, complementary and alternative therapies, international health care education, and technology literacy were subsequently excluded along with editorial and commentary articles. The remaining article abstracts were reviewed for compatibility with our research questions and, as applicable, included in our literature review of 21 articles. Data were extracted by 2 researchers using a standardized rubric and coded according to emergent themes. Coded data clustered around our research questions to further explain the impact of professional doctorates among health care professions.

RESULTS

Our first research question asked what doctoral education models are currently utilized among health care professional education programs in the United States. Results indicated that two-thirds (n = 10) of the 14 examined health professions following the medical model of postbaccalaureate entry-to-practice professional doctoral education with a didactic and clinical experience component. Less than a third (n = 4) of

Table 1. Professional and Accrediting Agency Web Sites Utilized During Research Process

Profession	Web Site
Audiology[13]	http://www.audiology.org/education/students/Pages/choosingprogram.aspx
Chiropractic[14]	http://www.acatoday.org/content_css.cfm?CID=746
Clinical[15] laboratory science	www.naacls.org.
Dentistry[16]	http://www.ada.org/316.aspx
Medicine[17,18]	https://www.aamc.org/initiatives/medaps/curriculumreports/ https://www.aamc.org/students/applying/requirements/
Osteopathic medicine[19]	http://www.aacom.org/resources/bookstore/cib/Pages/default.aspx
Pharmacy[20]	https://www.acpe-accredit.org/pdf/FinalS2007Guidelines2.0.pdf
Physical therapy[21]	http://www.capteonline.org/uploadedFiles/CAPTEorg/About_CAPTE/Resources/Accreditation_Handbook/EvaluativeCriteria_PT.pdf
Physician assistant[22]	http://www.arc-pa.org/documents/Standards4theditionwithclarifyingchanges12.2012fnl.pdf
Podiatry[23]	http://apma.org/Members/Education/CPMEAccreditation/PodiatricMedicalColleges/RevisionstoCPME120Adopted.aspx?FT=.pdf
Psychologist[24]	http://www.apa.org/ed/graduate/competency.aspx
Nurse practitioner[25]	http://www.aacn.nche.edu/dnp/Essentials.pdf.
Occupational therapy[26]	http://www.aota.org/Educate/Accredit/StandardsReview.aspx.
Optometry[27]	http://www.aoa.org/documents/OD_Manual_01_2011.pdf

surveyed professions reserved doctoral-level education for advanced practice, and only occupational therapy maintained both entry-level and advanced practice doctoral degrees. Nursing supports both master's and doctoral level advanced practice degrees, with the doctor of nursing practice promoted, but not mandated, as the preferred degree. Physician's assistants maintain master's-level professional education, with the US Army offering an advanced practice doctorate with a specialty in emergency medicine.[13–35]

The second research question explored the impact of entry-level clinical doctorates in health care professions on postprofessional training, productivity, and practice opportunities. Results suggested that entry-level clinical doctorates provide adequate knowledge and skills to begin clinical practice, but insufficient research and specialty training, necessitating further education after graduation. A theme of low student motivation to pursue further education after obtaining a clinical doctoral degree was also observed. Of the 15 professional doctoral degrees examined, only 4 required completion of an original research project (Table 2). Our review revealed themes of an overall shortage of faculty with research expertise and decreased research productivity among physical therapy faculty. Paradoxically, while academia may be negatively affected by clinical doctorates, practice opportunities were perceived to expand.[36–50]

The third research question focused on the influence of clinical doctorates on salary. Results indicated that salary trends among health professions that transitioned to clinical doctorates during the past decade reflected increases of 29–65% with a mean salary of $77 198 in 2009 (Tables 3 and 4).[51,52] Factors contributing to this increase were not evaluated.

DISCUSSION

Our review indicated that many health professions have adopted an entry-to-practice doctoral education model, which is perceived to increase practice opportunities, professional standing, depth and breadth of learning, and curricular space.[35,38,41] Distinct philosophical and role differences exist between professions that have embraced entry-level clinical doctorates and those that have reserved clinical doctorates for advanced practice (Table 2). Direct access to patient populations and health provider referral are 2 defining attributes of professions that have adopted clinical doctorates, not by virtue of the degree alone, but in accord with regulatory support and establishment of professional autonomy. Notably, professions requiring physician oversight or that are limited to a narrow range of technical tasks have not adopted doctoral education.[13–35,42–44]

Concerned stakeholders have articulated that clinical doctorates constitute degree inflation with unchanged entry to practice standards that are merely repackaged into a doctoral degree,[3,33,35] while others cite greater breadth and depth of foundational scientific knowledge, ability to critically adapt skills and knowledge in context of new knowledge, and comprehensive understanding that can be realized in a program with greater curricular space.[3,33,34,44,49] Additional supportive arguments include an assertion that entry-to-practice doctoral training assists in career advancement, leads to higher salaries, enhances third party reimbursement, and improves public recognition.[29,34,49] One study indicated that graduates with professional doctorates reported greater employment satisfaction compared with baccalaureate graduates.[44]

Some professions have observed unintended consequences with the transition to entry-level doctoral education. Academic departments housing physical therapy doctoral programs have experienced exacerbated shortages of qualified faculty and decreased research productivity.[38,47,53] Students reported low motivation to pursue advanced practice and research-oriented credentials citing finances, time constraints, disinterest, and lack of perceived benefit after already completing a doctoral degree.[30,36,45,54] Some professions, such as pharmacy, continue to debate whether students graduating with an entry-level clinical doctorate do so with insufficient patient access and clinical experience. The concept of mandatory postprofessional training (eg, residencies) following the completion of the entry-level clinical doctorate has

Table 2. Summary of Doctoral Education Programs Among 14 Health Professions

Profession	Doctoral Degree	First or Second Professional Degree
Audiology[13a]	Doctor of Audiology (AuD) or PhD	First
Chiropractic[14]	Doctor of Chiropractic (DC)	First
Clinical laboratory science[15]	Doctor of Clinical Laboratory Science (DCLS)	Second or third
Dentistry[16]	Doctor of Dental Medicine (DMD) or Doctor of Dental Surgery (DDS)	First
Medicine[17,18]	Medical Doctor (MD)	First
Osteopathic medicine[19]	Doctor of Osteopathy (DO)	First
Pharmacy[20a]	Doctor of Pharmacy (PharmD)	First
Physical therapy[21a]	Doctor of Physical Therapy (DPT)	First
Physician assistant[22]	Doctor of Science in Physician Assistant Studies (DScPA), not standardized	Second
Podiatry[23]	Doctor of Podiatric Medicine (DPM)	First
Psychologist[24]	Doctor of Psychology (PsyD) or PhD	First
Nurse practitioner[25a]	Doctor of Nursing Practice (DNP)	Second
Occupational therapy[26a]	Doctor of Occupational Therapy (OTD)	First or second
Optometry[27]	Doctor of Optometry (OD)	First

Abbreviations: DAT, doctor of athletic training; GPA, grade point average; MCAT, medical college admission test; PhD, doctor of philosophy.

[a] Indicates professions that have adopted clinical doctorates since 1999.

Table 2. Extended

Admission Requirements	Clinical Requirement
Bachelor's degree; meet graduate school requirements 90 hours of preprofessional biomedical education with minimum 2.5 GPA on 4-point scale	Supervised experiences in various settings, total hours requirement at institutional discretion Minimum of 1 year clinic-based patient care during educational program
Bachelor's degree; clinical library science (CLS) or medical technology (MT) certification; meet graduate school requirements	No national standard, varies by individual institutions
Varies by institution, all require biomedical science prerequisites and acceptable score on DAT standardized exam; baccalaureate degree recommended	Integrated in curriculum with progressive clinical responsibilities
Varies by institution, all require biomedical science prerequisites and acceptable score on MCAT standardized exam; baccalaureate degree recommended	Varies by institution, more focused during third and fourth year clerkship experiences; further post-graduate residency of 3–5 years depending on specialty; approximately 54 weeks
Varies by institution, all require biomedical science prerequisites and acceptable score on MCAT standardized exam; baccalaureate degree recommended	Varies by institution, more focused during third and fourth year clerkship experiences; additional postgraduate residency requirements of 3–5 years depending on specialty
Varies by institution; minimum of 2 academic years of basic and behavioral sciences with acceptable GPA; good writing skills and clean criminal record also required	300 hours during first three years balanced between community and institutional pharmacy settings; 1440 hours during last academic year
Baccalaureate degree	Must account for at least 1/3 of curriculum, approximately 24 weeks
Physician assistant (PA) certification, member of Army Medical Corp, acceptance to program	4300 hours of supervised patient care
Minimum 90 hours of undergraduate education, acceptable GPA	Varies by institution, more focused during third and fourth year
Baccalaureate degree	Varies by individual institution, usually requires a 1-year full-time internship
Baccalaureate degree, registered nurse certification, acceptable GPA	Varies by institution and specialty area, minimum of X000 hour
Baccalaureate degree	40 weeks of full-time supervised clinical experiences
Minimum of 3 academic years of study with acceptable GPA	Varies by institution; must meet all clinical competencies

emerged from this discussion.[36] However, adding a residency experience further increases the cost of doctoral level professional education, increasing ethnic and socioeconomic disparities, and decrease workforce diversity.[39–41,55]

In light of these consequences, nurses have reserved doctoral education for postprofessional training to enhance career advancement opportunities, help a practitioner specialize,[29,39,40] improve patient outcomes,[35] and support transla-

Table 2. Extended

Curriculum	Research Requirement	Program Length
Basic sciences core; 9 audiology competency areas	Exposure to professional literature and basic research methodology	4 academic years
14 core competencies established by the Council on Chiropractic Education plus any institutional competencies	None	4 academic years, with 4200 hours classroom, laboratory, and clinical experience
8 competency areas must be addressed through appropriate mix of didactic and clinical requirements	Research project, final treatise, or capstone project	3 academic years
15 minimum competencies integrated with biomedical, behavioral, and clinical science instruction	Integrated with curriculum; faculty must engage in research and programs must provide opportunities and support for student participation	4 academic years
Varies by institution, generally includes instruction in basic, biomedical, behavioral, and clinical sciences	Varies by institution; evidence-based medicine emphasized and basic familiarity required; research experiences may be summer internships or integrated in curriculum	4 academic years
Varies by institution, all provide instruction in basic, biomedical, behavioral and clinical sciences	Varies by institution; basic familiarity required; research experiences may be summer internships or integrated in curriculum	4 academic years
11 competencies integrating biomedical, pharmaceutical, social, behavioral, administrative, and clinical sciences	Ability to retrieve, analyze, and interpret professional, lay, and scientific literature; ability to evaluate quality of basic science and clinical research evidence and apply results to practice	4 academic years
66 competencies within 23 areas of professional practice expectations	Ability to access, evaluate, and apply current evidence within the literature to clinical practice; participate in written systematic reviews or original research	At least 3 academic years (90 semester credit hours)
Minimum of 740 hours focused classroom instruction and 70 hours of lab in advanced practice orthopedics and emergency medicine	Institutional review board-approved original research requirement	18 continuous months
Varies by institution, all provide instruction in basic, biomedical, behavioral and clinical sciences	Research design and methodology integrated in curriculum	4 academic years
15 step-wise competency benchmarks must be met to progress to each subsequent level of practicum, internship, and professional practice	Depends on degree program; PhD requires dissertation, PsyD usually requires a project	4–6 academic years
Varies by institution and specialty area, must include advanced content in health/physical assessment, physiology, pathophysiology, and pharmacology	Capstone scholarly project	4 academic years
Instruction in physical, biological, behavioral, clinical and sociocultural sciences, statistics, and human development to meet requirements of 100+ competencies	Ability to locate, understand, and evaluate research to make evidence-based practice decisions; ability to design and carry out research project	6 postbaccalaureate academic years
Instruction in physical, biological, and behavioral sciences; instruction in examination, evaluation, treatment, management, preventative care, and counseling	Varies by institution; basic familiarity required	4 academic years

tional research.[39] Advanced practice specialties within nursing include nurse practitioner (NP), clinical nurse specialist (CNS), certified registered nurse anesthetist (CRNA), and certified nurse midwife (CNM). Each advanced practice area has associated subspecialties, all of which are regulated by national specialty boards. Most advanced practice nursing programs have existed at the master's degree level, but the American Association of Colleges of Nursing has designated

Table 3. Salary Trends Among Health Professions with Standardized Doctoral Education

Profession	Professional Credential	Average Salary in 1999[28]	Average Salary in 2012[29]	% Increase
Audiologist[a]	Doctor of Audiology (AuD)	$45 670	$72 890	60%
Chiropractor	Doctor of Chiropractic (DC)	$70 930	$79 550	12%
Clinical psychology	Doctor of Psychology (PsyD) or Doctor of Philosophy (PhD)	$49 720	$72 220	45%
Dentist	Doctor of Dental Medicine (DMD) or Doctor of Dental Surgery (DDS)	$106 130	$166 910	57%
Medical doctor, doctor of osteopathy	Medical Doctor (MD), Doctor of Ostopathy (DO)	$104 090–$135 660	$180 850–$230 540	70–74%
Pharmacist[a]	Doctor of Pharmacy (PharmD)	$63 030	$119 450	90%
Physical therapist[a]	Doctor of Physical Therapy (DPT)	$58 350	$81 110	39%
Podiatrist	Doctor of Podiatric Medicine (DPM)	$100 090	$132 470	32%
Nurse practitioner[a]	Nurse Practitioner (NP), Doctor of Nursing Practice (DNP)	$61 800	$91 450	48%
Occupational therapist[a]	Occupational Therapist (OT), Doctor of Occupational Therapy (OTD)	$51 910	$76 400	47%
Optometrist	Doctor of Optometry (OD)	$77 750	$109 810	41%

[a] Indicates professions that have adopted professional doctorates since 1999.

the DNP as the terminal clinical degree to be implemented by 2015, though many programs have already adjusted their curricula.[3,8,25,30,56,57] A student must possess a bachelor of science in nursing and current registered nurse licensure before pursuing the 3-year doctor of nursing practice (DNP) degree.[8]

Implications for Athletic Training Profession

Currently, athletic training lacks clarity regarding the role, scope, and route regarding entry-to-practice and advanced clinical practice. If athletic training is to maintain its contribution and status among other health professions in the medical marketplace, then professional and postprofessional education must evolve.[10,11] When considering postprofessional education in athletic training, it would be prudent to consider the experiences of other health professions, salary trends, and desired future direction of the profession.

A survey of salary trends among those health professions who have moved to clinical doctorates during the past decade reflects increases of 29–65% with a mean salary of $77 198 in 2009. During this same time period, athletic training salary trends experienced only modest gains, with the US Department of Labor, Bureau of Labor Statistics reporting a nationwide mean salary of $41 600 in 2012, which is the most recent year for which data is available.[51,52] A comparison of 2012 salaries indicated athletic trainers are paid the lowest among health professions, even lower than nondegreed physical therapy assistants (Table 4). As clinician salaries largely depend upon billed services, not earned degree, these salary gains among professions that have adopted clinical doctorates may reflect increases in patient access, ability to provide expanded services, and adequate accepted billing rates.[53]

Despite languishing salary trends, the US Department of Labor estimated that employment opportunities for athletic trainers would grow much faster than average with early estimates projecting a 30% increase between 2010 and 2020, and more recent projections indicating 19% projected growth between 2012–2022.[58] Job growth will be concentrated in the health care industry, where athletic trainers are anticipated to help reduce health care costs for both hospitals and private clinics. Concomitant with this job growth, third-party reimbursement is expected to increase as athletic trainers continue to provide high-quality, cost-effective care and take a more visible role in collaborative health care teams.[54] The hope is that as athletic trainers become more entrepreneurial in establishing private practices and third-party reimbursement rates increase for provided services, higher salaries will follow. However, since historical salary trends indicate unlikely dramatic increases to support higher educational costs, entry-level doctoral education is not feasible and therefore should be reserved for advanced practice.[41,53]

Current enrollment trends indicate continuing demand for professional athletic training programs at the master's degree level as evidenced in growth from 1 program in 1996 to 28 in 2013.[59] The NATA Executive Committee for Education recommended that interprofessional education be required in both professional and postprofessional education and that programs should align with schools of health professions. Furthermore, programs should provide career advancement and skill development specifically related to athletic training clinical practice. We interpret this recommendation as expanding opportunities for athletic trainers beyond traditional institutional athletic departments and into the wider health care marketplace. Adoption of a clinical doctoral education model must support the future of the profession with consideration of professional impact.[60] Implementing

Table 4. Salary Trends Among Health Professions Without Standardized Doctoral Education

Profession	Professional Credential	Average Salary in 1999[28]	Average Salary in 2012[29]	% Change
Athletic trainer	Certified Athletic Trainer (ATC)	$33 650	$44 010	31%
Dental hygienist	Registered Dental Hygienist (RDH)	$48 150	$70 700	47%
Medical laboratory technologists	American Medical Technologist (AMT)	$39 310	$58 640	49%
Physical therapy assistants	Physical Therapy Assistant (PTA)	$33 500	$52 320	56%
Physician assistant	Physician Assistant (PA) or (DScPA)	$50 650	$92 460	83%
Radiation therapist	Certified Medical Dosimetrist (CMD)	$43 360	$80 410	85%
Registered nurse	Registered Nurse (RN)	$44 470	$67 930	53%
Respiratory therapist	Respiratory Therapists (RT)	$36 860	$57 200	55%

these recommendations most likely requires a change at the professional level combined with a transition away from the current postprofessional model of education (eg, a master's degree in a tangentially related field) to meet the goals and needs of all stakeholders. While some formal advanced training opportunities do currently exist (eg, doctoral degrees, residency programs), they typically lack advanced skill development specific to athletic training, regulatory oversight, professional advocacy, and clinical experiences in a variety of practice settings (eg, hospital rehabilitation, industrial settings, surgical settings).[3,36,39] Remediation of these deficiencies will help maintain clinical relevance, health care provider status, appropriate salary, and allow students to become advanced practitioners who are focused on evaluating their practice through the process of patient-oriented and disease-oriented clinical outcomes.

CONCLUSIONS

Most health care professions follow the medical model for professional preparation, though at reduced intensity with fewer clinical hours than physician training. Clinical doctorates have become the new educational standard among most health professions with perceived increases in professional opportunities and are associated with higher salaries. However, research training, research productivity, diversity, and professional debt burden have been negatively impacted by this trend. Various strategies have successfully incorporated clinical research training into existing professional and postprofessional doctoral programs but must be planned into the curriculum.

When athletic training education is considered in context with trends in other health professions, it appears that the most realistic next step for athletic training education is to transition to the master's degree for entry to the profession and officially reserve the Doctor of Athletic Training for advanced practice. Furthermore, vigorous efforts to expand opportunities for direct access to patient populations and increased reimbursement rates are necessary to secure athletic training's place as a provider of patient services and improve professional standing beyond the technician's role to which many athletic trainers have been relegated. The official stance by the profession is important to maintain athletic training's professional niche and provide clarity in the profession's educational sequencing. Currently, no entry-level doctoral degrees in athletic training exist, which makes official decisions on the future of professional and post-professional education timely. If not prohibited, it will only be a matter of time until we see our first entry-level doctoral degree in athletic training, which will once again create degree ataxia. With careful planning, athletic training can learn from consequences of policy changes among other professions, strategically avoid repeating mistakes, and create a roadmap to the future that will ensure professional integrity and viability in the healthcare marketplace.

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