INSIDE

Career: Eyeing Physician Career Boost Via Formal Business Education. Pg. 1

Career: Physician Employment Contracts: Strategies for Avoiding Pitfalls. Pg. 9

Clinical: Acute Ischemic Stroke, as published in the New England Journal of Medicine. Pg. 16

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September 3, 2020

Eyeing Physician Career Boost Via Formal Business Education

Getting a business degree can be highly rewarding, but planning and foresight are essential

By Bonnie Darves

Physicians pursue formal business education for a whole host of reasons, but there are some common threads. For many, it’s a desire to effect change within their organizations or even health care delivery as a whole. For others, a master of business administration (MBA) or master of medical management degree (MMM), or the Certified Physician Executive (CPE) credential, is viewed as a way to better position them as credible participants in big-picture discussions about organizational direction or in decisions that affect their professional lives or their specialty’s future.

Increasingly, especially in large organizations, the business degree may be a requirement for seeking a senior leadership position. Some physicians have a specific reason for getting an MBA or MMM, such as launching a new clinical service. A final subset of physicians obtains formal business education as a first step toward exiting clinical medicine and moving wholesale into a nonclinical leadership role.

For internist Pamela Sullivan, MD, MBA, the driver was twofold. She needed a better understanding of the business world to help her perform more effectively in the leadership realm in which she was already functioning as a medical director. She also wanted to make a better-informed decision about how to focus the rest of her career.

“I realized that I needed to know more, and that I needed to be able to speak the [business] language whether I was in a clinical meeting or a business meeting,” said Dr. Sullivan, who is chief clinical officer of implementation for Landmark Health, which partners with health plans and uses a “house calls” model to care for patients with multiple chronic conditions. “The MBA program gave me the confidence I needed to do that.”

Dr. Sullivan opted for the one-year physician executive MBA program at the University of Tennessee’s Haslam School of Business. In part, she chose it because it was shorter than some MBA programs, but also because she wanted a practical curriculum and the face-to-face experience of the four weeks of onsite residence. “I learn by doing, and this program was not...
about taking exams — we got real-life practical assignments. It was so energizing,” Dr. Sullivan said.

Andrew Furman, MD, MMM, took a more stepwise, protracted approach to getting his master’s in medical management. The emergency medicine physician started by taking courses through the American College of Healthcare Executives and the American Association for Physician Leadership (AAPL) over a few years. He then carried those credits into the MMM program at University of Southern California (USC) in Los Angeles, which he completed in 2017. Today, after stints at Geisinger Health System, and Salem Health in Oregon, he is medical director for Accolade, Inc., an innovative private care-delivery and benefits company serving self-insured employers.

The slower approach enabled Dr. Furman to initially select courses on topics that related to issues he was encountering in his work, while allowing him to accrue credits toward an eventual master’s degree. “I started piecemeal when I was three years out of residency and was doing committee work. The AAPL courses were fantastic because they set me on a path to a one-year USC program,” Dr. Furman said.

From the outset, Dr. Furman was clear about his motivation for learning about business: “I wanted to be part of the change in health care, and any change that occurs affects physicians,” he said. “If you just want the three letters after your name, you might not get much out of it. If you want to shake up the mess we’re in in health care, you will.” For Anil Singh, MD, MPH, MMM, executive medical director of clinical transformation at Highmark Health and system division director of Critical Care at Allegheny Health Network in Pittsburgh, Pennsylvania, the decision to obtain a business degree arose in part out of frustration. “I was being asked increasingly to do things that did not involve patient care, and to help fix issues,” said Dr. Singh, who obtained his MMM from Carnegie Mellon University. Business people sometimes asked him to write a pro forma or show ROI (return on investment) when he proposed a solution.

“I had no idea what they were talking about and decided I needed to understand the jargon. Being in the program opened up a different side of my brain that I’d never used before,” Dr. Singh said. “Now, when I speak to businesspeople in their own language, I’ve got immediate ‘street cred’.”

Benefits of business education: professional and personal

Like Dr. Singh, other physicians interviewed for this article were unanimous on one key benefit of formal business education: becoming conversant in the language spoken in board rooms and management meetings.

“I knew that if I was going to be communicating with CEOs and CFOs, and marketing directors, I needed to understand their language — and I needed the credentials and knowledge to participate effectively. The MBA gave me that confidence,” said anesthesiologist Talal Ghazal, MD, MBA, co-director of the Holy Cross Hospital Pain Center in Wheaton, Maryland. “I also wanted to learn about something I wasn’t trained in. I found that business is no big mystery — it’s a matter of understanding the fundamentals and concepts.”

Physicians who pursued MMM and MBA degrees that included an onsite component also cited interactions and continued networking with their cohort members as a major benefit.

“Working on an MBA, MMM, or CPE helps you develop a network of colleagues with similar goals or interests, who become an ongoing resource for advice or counsel,” according to John Jurica, MD, MPH, CPE, medical director of an Illinois urgent care network who blogs and delivers podcasts on physician leadership.

For Dr. Furman, the networking was especially gratifying. “The cohort experience was amazing. You learn so much from being in the room with people with varied backgrounds who often are experiencing similar issues,” he said. The diverse specialty and background profiles of a typical MBA cohort enrich the learning experience, notes Kate Atchley, PhD, executive director of the University of Tennessee’s Physician Executive MBA program. “In a typical year, we’ll draw physicians who are entrepreneurial-minded, some who are in mid-career or are already in administrative positions who want business acumen, and younger physicians who know that medicine is changing and want to be part of that change,” she said. “The benefit of the physician-only environment is that the students come in with the same educational background and the same experience of clinical work — they can relate to each other.”

Dr. Singh’s cohort, for example, included hospitalists, internists, cardiologists, a pathologist, and a palliative medicine physician. “Learning from the other physicians was a phenomenal experience,” he said.
Rex Kovacevich, MBA, a professor of clinical marketing in USC's MMM program, sees those valuable interactions firsthand. He often witnesses physicians sharing their stories and experiences, and in doing so, helping each other deal with situations in their own organizations or professional lives. “That’s one of the key benefits of the cohort model — the physicians become comfortable sharing with each other,” said Mr. Kovacevich. Monique Butler, MD, MBA, chief medical officer for Swedish Medical Center, in Englewood, Colorado, cites those networking benefits and the resulting relationships she built as an important outcome of her participation in the University of Tennessee's Physician Executive MBA program. “The cohort experience gives you a huge support network. We’re able to just pick up the phone and call each other when we’re working through a challenge,” she said. “It’s been incredibly helpful.”

Weighing the education options

The chief decision physicians face when they decide to pursue business education is choosing which route to take. The formal physician executive MBA, MMM, and CPE programs teach similar content, but their formats differ. The traditional MBA program, offered online or in a hybrid online/on-campus format, or as an immersive on-campus experience, ranges from one to two years and focuses on business theory, concepts, and principles. There are more than two dozen traditional MBA programs that have a health care business or leadership focus. Several universities now offer physician-only executive MBA degrees structured to accommodate the schedule constraints of practicing physicians and to deliver targeted content. Programs developed as part-time offerings often impose a maximum time for completion.

The MMM, a more recent entrant in the business-degree realm, is designed specifically for physicians and typically targets those who are at least three years out of residency. Physicians who pursue an MMM often end up serving as medical directors, department chairs, chief medical officers, or president/vice president of medical affairs. The programs run 12 to 18 months, and prerequisites might be required. These programs incorporate online learning and an onsite residential component several times annually. Common courses include organizational management, health economics, health policy, health finance, health law, and operations management.

Maeleine Mira, director of the MMM program at USC's Marshall School of Business, said that a key feature of the MMM curriculum is that it's designed to teach students how the business cases apply in health care. “That’s one of the benefits of the MMM compared to traditional MBA programs,” she said. “Every student graduates with an implementable capstone, so that they’re ready to go back and institute changes.” USC also offers a pre-MMM fellowship option for final-year residents.

When considering any MBA or MMM program, prospective participants should carefully evaluate the content focus to choose a program that suits their individual needs or career objectives, several sources pointed out. Physicians should also keep in mind that some programs require that participants have three to five years of clinical experience post-residency.

The CPE that AAPL offers focuses heavily on both business content and leadership training and is pursued on a course-by-course basis in a 150-credit curriculum consisting of online learning and live events. The focus is on hands-on learning. The CPE offers flexibility for participants who might need to complete the curriculum at an uneven rate or over a longer period, and it requires a final capstone project and audiovisual presentation. A sophisticated technology platform facilitates interaction among learners, and AAPL also provides professional development resources such as career assessment and executive coaching.

Typically, physicians earn their CPE designation in two to 2 years, according to Peter Angood, MD, AAPL’s president and chief executive officer. AAPL also partners with five universities to enable students to complete prerequisites toward master’s degrees and easily transition into those programs.

Other degrees that include some business content include the master in healthcare quality and safety management (MS-HQSM) and master of science in the science of healthcare delivery (MS-SHCD), as well as clinical informatics degrees. The master of health administration also includes business principles but focuses on applied health care experience.

When choosing a degree program, especially an MBA, physicians should be fairly clear about what they want to achieve, Dr. Jurica advises, in part because of the financial investment. That might range from under $10,000 for an online-only program to $100,000 for a big-name university MBA. The CPE path is generally less expensive than the traditional MBA or MMM program, he added. “It might be worth waiting to start a program, if there’s a way to get your employer to help with the costs,” Dr. Jurica said.
He also advised physicians who aren’t ready to commit to a program to consider taking business courses through the AAPL, specialty organizations, online programs, or local education institutions.

“It’s important to decide whether you need the name recognition — which might be the case for those who will compete for a senior management position at a large organization — or just the degree and the core business knowledge,” Dr. Jurica said. In the latter case, an economical online program might suffice.

**What to expect**

The prospect of continuing clinical practice while obtaining a business degree can be daunting, but it’s is doable for physicians who organize their time efficiently and strategically, sources agreed. The MBA and MMM programs typically carry a workload of 12 to 25 hours weekly, in addition to the onsite periods.

Physicians who want to get a business degree should plan well in advance, all sources said, and should ensure they will have support from their families, colleagues, and organizations before they start. Ideally, they should also try to either reduce or reconfigure their clinical hours to accommodate program demands. “The most important aspects of preparing for a graduate business degree are figuring out how you’ll arrange your time when you add the program to your other responsibilities and making sure that those close to you — your spouse, your coworkers, your children — are onboard,” said Mr. Kovacevich.

That’s one reason that Dr. Ghazal, who obtained his health care MBA from George Washington University in Washington, D.C., encourages physicians who are eyeing a specific role to consider getting a degree earlier in their careers. “By the time you get to mid-career, and have a demanding practice and a family, it can be a challenge to fit it in because of the time requirements — you basically have a deadline every week.”

Deborah Vinton, MD, medical director of the emergency department at the University of Virginia in Charlottesville, found herself on a crash course path when she began the University of Tennessee Physician Executive MBA, five years after finishing residency. She started the program just six weeks after delivering her third child. Despite the logistical challenges, the timing was important: she had an opportunity to participate in planning the UVA’s new emergency department and needed business credentials to be effective.

“I wanted to be a physician leader at this academic center, and I knew I needed this education,” Dr. Vinton said. The school and her cohort were “amazingly supportive,” she said, and she was able to bring her infant daughter with her for the onsite residency portions. “I was surprised by how accommodating everyone was — I didn’t expect that,” she said.

For Jamie Eng, MD, MMM, who completed her MMM at USC as a continuation of the administrative emergency fellowship that program offers, the degree better equipped her for the administrative work she was already doing at USC-Los Angeles County Medical Center. “It was fortuitous because the fellowship actually required me do the MMM. I looked at other administration fellowships, but this was such a good fit that I decided I might as well get the degree,” said Dr. Eng, who is associate medical director of emergency medicine at Providence Tarzana Medical Center in Tarzana, California, and director of the USC Administrative Emergency Medicine Fellowship program.

“The cohort was fantastic,” Dr. Eng said. “I feel like my administrative experience was sped up by a decade learning from the experiences of others.”

**Tips for choosing a program and planning the journey**

Physicians interviewed for this article offered the following additional guidance for their colleagues planning to pursue formal business education:

“When you’re evaluating programs, look at how the curriculum and the schedule can intersect with your job. If you’re not able to merge your work with the requirements, you might have to consider other options.” — Deborah Vinton, MD, MBA

“I think it’s important to get awareness of the various learning opportunities, so that you have a better sense of what you want for your professional growth.”

— Peter Angood, MD, AAPL president and CEO

“When you’re looking at programs, be clear about your career and where you want to be in five years — and how a particular program or fellowship is going to get you there.”

— Jamie Eng, MD, MMM
Physician Employment Contracts: Strategies for Avoiding Pitfalls

By Bonnie Darves

As physicians increasingly opt for practice opportunities in employed-model arrangements, and hiring entities move toward standardizing employment contracts to simplify matters and ensure equitable treatment of existing and incoming physicians, it might appear that there’s scant room for negotiating contract terms.

That’s not a prudent attitude to take about such an important document, contract lawyers maintain. That employment agreement not only dictates the next year or two of a physician’s career but also could potentially negatively affect his or her personal and professional life for years into the future.

Benjamin J. Mayer, JD, MBA, a Denver lawyer whose firm specializes in physician contracts, advises physicians to take the position that any terms that aren’t favorable can — and should — be made more reasonable. “The physician might not be able to get a higher starting salary or a larger sign-up bonus but definitely should negotiate anything that’s explicitly unfair or clearly intentionally ambiguous,” Mr. Mayer said.

Key examples he cites are contracts with onerous non-compete provisions that would prevent a departing physician from working within, say, a 60-mile radius of any of the employer’s locations, or contracts that contain little detail about weekly work hours and schedules, or call requirements. Essentially, anything that is vague or an overreach should be modified and specified.

“The physician needs to require reasonable boundaries on all of the contract’s terms,” Mr. Mayer said. For example, any non-compete radius should be drawn from a single primary location, not from all of a sprawling mega-health system’s hospitals and clinics. Similarly, regarding schedules, the contract should at least specify a cap on total weekly hours or days worked and should dictate an equitable call schedule.

“As duties, hours, and responsibilities should be spelled out, and if the call coverage isn’t specified, the contract should at least state that those duties will be ‘equally divided among all physicians’ in the group,” Mr. Mayer said. He acknowledged that some young physicians might be willing to shoulder commensurately more call duty than their peers if they’re trying to pay off medical school loans, for example, but such special arrangements are best addressed outside of the contract.
Embracing("super
groups") affect contracts

Emerging “super groups” affect contracts

On a global scale, practice acquisition and management trends — specifically, the growing influence of private equity on physician practice and facility management and the creation of huge organizations that operate scores of groups — are affecting physician employments. Rebecca Gwilt, a Richmond, Virginia, lawyer and partner in Nixon Law Group, said she is witnessing a “trickle-down effect” on contracts as private equity–operated super groups emerge.

“We’re seeing a more sophisticated framework for physician contracts,” Ms. Gwilt said, as well as a tendency toward shorter employment terms and slimmer benefits. “Legally, these companies aren’t permitted to influence the delivery of services, but in general, they’re non-physician companies, which means that the MBAs are making contract decisions, not physicians,” said Ms. Gwilt, who frequently speaks on physician contract issues. “So, as this model becomes more common, market salaries and benefits could change.”

Although the trend toward super-group formation isn’t inherently negative — such groups have more bargaining power regarding physicians’ reimbursement rates than smaller ones do, generally — it does call for due diligence and research on the part of physicians who consider interviewing with such entities. “You first should find out who runs the company, because you will have less room to negotiate a contract than with a physician-owned practice,” Ms. Gwilt said. “You want to know what it’s like to work there, so I advise clients to ask for the name of the last physician hired — someone who’s been there for a year — and then talk to that physician.”

The movement toward “corporatization” of medicine, in tandem with the fluctuating health care economic, reimbursement, and policy environment, is prompting employers to reduce their financial risk wherever possible. One example is instituting shorter contract employment terms, which enables employers to more easily let go of poor-performing physicians. Another recent development is the setting of limits on how much individual physicians can earn, regardless of their productivity, according to Kyle Claussen, CEO of Resolve Physician Agency, a Missouri-based firm that counsels physicians on contract issues.

“It’s becoming more prevalent to see clauses with caps on compensation, such as the 75th or 90th percentile in a major national survey such as the Medical Group Management Association survey,” Mr. Claussen said. Although such caps aren’t likely to affect most physicians coming out of residency because starting salaries are rarely set at those percentiles, the caps could penalize high-income specialties such as neurosurgery and orthopedic surgery as those physicians move into their second and third years of practice. “I’ve seen some high-income specialists walk away from those potential jobs,” he said. He added — and other sources concurred — that sign-on bonuses are less common now than they were a few years ago, possibly for some of the same economic reasons.

Another contract area where shifts are occurring involves bonuses and productivity-based compensation, several sources mentioned. As employers, as well as government and commercial insurers, move toward providing monetary incentives to physicians for performance on measures ranging from patient satisfaction to hospital readmissions, it’s important to know how such payments are handled on the employer side. This is particularly the case with any bonuses or incentive payments that may be due a physician, Mr. Schaff pointed out.

For example, if the contract states that incentives and bonuses are paid only through the employment period or only at the end of a calendar year, the physician might lose out on a substantial sum if he or she leaves the job on, say, Dec. 22, rather than Jan. 1 of the following year. Ideally, the contract should call for payment of “all bonuses earned through the time of termination.”

Ditto for accounts receivable monies that physicians might be due. It’s very common for such monies to continue flowing to the practice for several months after a physician departs, so ideally, Mr. Schaff suggested, the contract should call for reporting on such funds for a specific period after...
termination and ultimately paying out what's due at, say, 60, 90, or even 180 days post–termination of employment. “This is all over the map in contracts I've seen,” Mr. Schaff said. “I've even seen contracts that state that the physician only receives payments through the last day of employment. This is something that should be negotiated.”

At the other end of the spectrum, physicians whose contracts set minimum or expected productivity or quality performance targets in order to continue the base salary beyond year one should understand not only what those requirements are but also — and more importantly — whether they're achievable and reasonable. That means talking to other physicians at the prospective practice to see how they’ve fared in year two in productivity. It's also helpful to find out how much personal effort is required to track the performance metrics that underlie performance payments, several sources advised. Mr. Mayer said that when a base salary arrangement converts to a totally productivity-based one at the end of the first year, he often negotiates for something less dramatic, such as continuation of the base salary for an extended period or and perhaps a part-base/part-productivity structure.

“The point is that your contract governs how your money works, and compensation structures are becoming increasingly complicated,” Ms. Gwilt said. “That's why it's really important that physicians understand those structures and obtain legal review.” It's not uncommon for compensation methodologies to incorporate a half-dozen components beyond base salary, such as incentive bonuses or “clawbacks” (monies returned to the employer for underperformance or other reasons) based on quality measures, cost metrics, patient-specific clinical measure reporting, compliance, and shared-savings, to name a handful.

On a final note, all sources stressed the importance of physicians reading every word of the contract and obtaining expert review. The point is to make sure that physicians understand what the contract entails and what its provisions would look like in their daily lives, by requesting specific examples of not only what's expected of them but also what might happen should they leave the position prematurely. “One thing that physicians need to think about but are reluctant to ask is this: What happens if they want to get out or if the employer wants to terminate the contract?” Ms. Gwilt said. “If there's a penalty clause, that should be highly negotiated.”

Contract pitfalls to watch for

Contract language that's vague and highly employer favorable. Such language might show up in any area of the contract, but it's especially problematic when it comes to physician schedules and duties, according to Ms. Gwilt. “You want to beware of anything that states, 'X will be determined by the practice at its discretion,'” she said. That leaves the physician open to whatever the employer decides at any time during the contract period. At the least, physicians should negotiate to add that the terms be “fair and reasonable, and in accordance with [requirements] for all like colleagues.”

Mr. Mayer provides an example of where “at the practice's discretion” could have a serious lifestyle effect: unspecified practice locations. As organizations merge and/or add satellite facilities, a vague location clause might mean that physicians could be required to commute to or travel among four different clinics or hospitals. Mr. Mayer suggests that physicians ask prospective employers to specify locations and limit their number contractually, or at least give the physician the opportunity to decide if she or he is willing to expand the number.

Highly restrictive non-compete clauses. Syracuse, New York, attorney Andrew Knoll, JD, MD, cautions physicians to beware of and negotiate onerous non-compete terms when employers aim to keep physicians from working for a slew of specific competitors. “I've seen clauses that state, ‘Within two years of leaving the practice, the physician cannot work for health system Y or hospitals A, B, or C.' That's overly broad. Others might restrict the employee from going to a particular large health system, but not to smaller hospitals or systems in the same urban area,” Mr. Knoll said. “These clauses should always be reviewed.”

Unreasonable benefit start dates. One pitfall with benefits is not ensuring that they commence at a reasonable time, Mr. Schaff observed. For example, if a contract stipulates that that health insurance benefits start on the first day of the month following hiring or 90 days hence, he said, “The physician could be on the hook for paying the premiums for COBRA [continued coverage from the previous employer]. At the least, if the benefits start date can’t be modified, the incoming physician might try to negotiate that the employer pay the COBRA premiums until the coverage starts.”

Onerous — or unspecified — indemnification or liquid damages clauses, especially regarding malpractice claims. The first order of business here is to understand any limitations that employer-paid malpractice coverage
might have, and then ensure that the employed or contracted physician isn’t on the hook fully for additional damages that the policy doesn’t cover, Mr. Mayer advised. For example, if the malpractice coverage tops out at $1 million and the judgment comes in at $1.25 million, some contracts might shift the entire shortfall to the physician, explicitly or not so explicitly. “Such a provision might say that ‘the practice and the doctor agree to indemnify and hold each other harmless for any liability caused by the other,’” Mr. Mayer said. “It sounds and seems fair, but in practice, the malpractice claim will usually follow the physician, not the practice. This is something that requires careful review and possibly negotiation.”

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Acute Ischemic Stroke

William J. Powers, M.D.

This Journal feature begins with a case vignette highlighting a common clinical problem. Evidence supporting various strategies is then presented, followed by a review of formal guidelines, when they exist. The article ends with the author’s clinical recommendations.

A 62-year-old, right-handed, independently functioning man presents 1 hour after a sudden, witnessed onset of speech difficulty and right-sided numbness and weakness. He is alert with moderate aphasia, facial weakness on the right side, and weakness in the right arm and leg with decreased sensation to light touch. His blood pressure is 160/95 mm Hg, plasma glucose level 79 mg per deciliter (4.4 mmol per liter), and body temperature 37.2°C. His medical history is unremarkable, and he is taking no medications. Noncontrast computed tomography (CT) of the head shows slight hypodensity in the left insular cortex (Fig. 1A). What would you do?

The Clinical Problem

Each year in the United States, approximately 700,000 people have an acute ischemic stroke.1 Before modern treatments, early mortality was 10%.2 Among survivors, one half had moderate-to-severe neurologic deficits, and a quarter were dependent on others.3 The introduction of intravenous alteplase in 1995 led to substantial improvement in outcomes.4 More recently, effective mechanical thrombectomy has radically altered initial management in many patients.5 Understanding treatment options for acute ischemic stroke is important to ensure prompt administration of appropriate care or referral.

Strategies and Evidence

Treatment for patients with acute ischemic stroke is guided by the time from onset of stroke, the severity of neurologic deficit, and findings on neuroimaging. By convention, the time of stroke onset is established as the time that the patient was last known to be well (i.e., in a normal or baseline state, as confirmed by medical history). For persons who awake with stroke, this time will be sometime before they went to sleep. The severity of neurologic deficit is measured by means of the National Institutes of Health Stroke Scale (NIHSS), on which scores range from 0 to 42, with lower numbers indicating milder deficits.6 Deficit severity is further characterized as nondisabling or disabling if it would prevent performance of basic activities of daily living or return to work. Initial evaluation and imaging

Rapid onset of neurologic deficits localized to a single cerebral arterial vascular territory is the archetypal clinical presentation of acute ischemic stroke. The blood glucose level should be measured routinely to exclude hypoglycemia. Brain imaging is necessary to rule out intracerebral hemorrhage; noncontrast CT is preferred because of its availability, rapidity, and high sensitivity. Magnetic resonance imaging (MRI) with special sequences can also be used.7 In clinically typical cases, a noncontrast CT that shows no other explanation for the neurologic deficit is sufficient to diagnose acute ischemic stroke on initial imaging; diffusion-weighted MRI is not necessary. Because the benefits of treatment for acute stroke are time-sensitive, initial diagnostic imaging should be performed quickly. Further neuroimaging may be required to determine eligibility for some interventions.8 Noncontrast CT is used to determine the Alberta Stroke Program Early Computed Tomography Score (ASPECTS), scores range from 0 to 10 on the basis of ischemic changes in the territory of the middle cerebral artery, with 0 indicating the most extensive ischemic changes.9 Diffusion-weighted MRI and perfusion CT measurements are used to define ischemic brain tissue that is probably irreversible damaged (“core”). Delayed arrival of contrast, as shown on perfusion MRI or perfusion CT, is used to define ischemic tissue that is potentially salvageable (“penumbra”). MR angiography (MRA) and CT angiography (CTA) show the location of intracranial arterial occlusions (Fig. 1B).10 In patients with renal insufficiency, time-of-flight MRA (which does not use contrast) can be used to identify arterial occlusions and inform therapeutic decisions.

Measurement of response to treatment

Clinical benefit is conventionally measured with the use of the modified Rankin scale, on which scores range from 0 (no symptoms) to 6 (death). A score of 1 indicates an ability to carry out all usual duties and activities despite symptoms. A score of 2 indicates an inability to carry out all normal activities but an ability to look after one’s own affairs without assistance.11

Treatment options

Alteplase within 4.5 Hours after Stroke Onset

Randomized, controlled trials have shown that intravenous administration of alteplase (at a dose of 0.9 mg per kilogram of body weight over 60 minutes [maximum total dose, 90 mg], with the first 10% of the dose given as a single bolus over 1 minute) within 4.5 hours after the onset of stroke reduces disability from acute ischemic stroke.12 Intravenous alteplase has shown benefit for patients with disabling stroke regardless of the NIHSS score; it is not recommended for those with NIHSS score of 0 to 5, for those with associated conditions in which the bleeding risk is excessive, or for those with CT evidence of extensive irreversible injury. Intravenous alteplase is considered a first-line agent in eligible patients.13

Before the administration of alteplase, no neuroimaging other than initial diagnostic noncontrast CT is necessary. Given the low prevalence of unsuspected coagulopathies, intravenous alteplase should be administered while the results of hematologic tests are pending if there is no reason to suspect an abnormality. On the basis of the National Institute of Neurological Disorders and Stroke (NINDS) trial protocol for...
the use of tissue plasminogen activator, the blood pressure must be lower than 185/110 mm Hg before and during infusion and lower than 180/105 mm Hg for at least the first 24 hours thereafter. Patients who have received intravenous alteplase are admitted to an intensive care unit or specialized stroke unit for close neurologic monitoring and blood-pressure control, if necessary.

The benefit of intravenous alteplase is time-dependent. In a meta-analysis of nine randomized, controlled trials, 32.9% of the patients in the alteplase group, as compared with 23.1% of the patients in the control group, had a favorable 3-month outcome (defined as a modified Rankin scale score of 0 or 1) when treatment was administered within 3 hours after the onset of stroke (adjusted odds ratio, 1.75; 95% confidence interval [CI], 1.35 to 2.27); the corresponding rates were 35.3% and 30.1% when treatment was administered between 3 and 4.5 hours after onset (adjusted odds ratio, 1.26; 95% CI, 1.05 to 1.51). Large intracerebral hemorrhage occurred in 6.8% of the patients in the alteplase group and in 1.3% of those in the control group. The overall outcomes, as assessed by the modified Rankin scale, among the patients in the alteplase group reflected the deleterious effects of hemorrhage along with the beneficial effect on ischemic stroke recovery.

Alteplase at More Than 4.5 Hours after Stroke Onset
In the WAKE-UP (Efficacy and Safety of MRI-guided Thrombolysis in Wake-Up Stroke) trial, 503 patients with a time of onset of disabling acute ischemic stroke that was unclear, but greater than 4.5 hours from the time last known to be well (94% of whom awake with stroke), were randomly assigned to receive intravenous alteplase at a standard dose or placebo administered within 4.5 hours after the recognition of stroke symptoms. Patients were eligible if they had an abnormal signal on diffusion-weighted MRI, no visible signal change on fluid-attenuated inversion recovery imaging, a lesion on diffusion-weighted MRI, perfusion MRI, or perfusion CT to determine eligibility, such testing is not required and could lead to the exclusion of patients who might benefit from treatment. In a meta-analysis of nine randomized, controlled trials that used imaging eligibility criteria to support a benefit of late administration of intravenous alteplase (4.5 to 9.0 hours after the onset of stroke or measured from the mid-point of sleep), a pooled analysis of patients with a penumbra-to-core ratio of greater than 1.2 and a core volume of less than 70 ml (as shown on perfusion CT or diffusion-weighted MRI with perfusion MRI), a greater percentage of those in the alteplase group than in the control group had a good outcome (defined as a modified Rankin scale score of 0 or 1) at 90 days (36% vs. 29%; adjusted odds ratio, 1.86; 95% CI, 1.15 to 2.99).13 Enrolled patients had much larger penumbra-to-core ratios and lower core volumes than the limits set by eligibility criteria (a mean penumbral volume of 63.9 ml and a mean core volume of 8.0 ml in the alteplase group). In health care settings where mechanical thrombectomy is not available, patients who are within the treatment window of 4.5 to 9.0 hours can be considered for intravenous alteplase on the basis of the characteristics of the patients enrolled in these trials. However, mechanical thrombectomy is preferred when available.

Mechanical Thrombectomy within 6 Hours after Stroke Onset
Mechanical thrombectomy entails passing an intraarterial catheter from a peripheral puncture into an intracranial artery and removing an occluding thrombus by ensnaring it or by suction (Fig. 1C and 1D). Mechanical thrombectomy, performed within 6 hours after the onset of stroke, is another first-time treatment for selected patients on the basis of multiple randomized, controlled trials that have shown a benefit. These trials primarily enrolled patients 18 years of age or older who had a prestroke score of 0 or 1 on the modified Rankin scale, a causative occlusion of the intracranial internal carotid artery or the first segment of the middle cerebral artery, an NIHSS score of 6 or higher, and an ASPECTS value of 6 or higher, in whom treatment was initiated ( groin puncture) within 6 hours after onset.14,15 Although other trials used diffusion-weighted MRI, perfusion MRI, or perfusion CT to determine eligibility, such testing is not required and could lead to the exclusion of patients who might benefit from treatment. Pooled data from five randomized, controlled trials showed that the percentage of patients who had a modified Rankin scale score of 0 to 2 at 90 days was higher among those who underwent stent-retriever mechanical thrombectomy than among those who did not (46.0% vs. 26.5%; adjusted odds ratio, 2.49; 95% CI, 1.76 to 3.53).16 In both groups, 85% of the patients received...
intravenous alteplase. Mechanical thrombectomy can also be performed alone in patients who are ineligible for intravenous alteplase because of the risk of bleeding. As with alteplase, the benefit of mechanical thrombectomy is time-dependent.9,10 These trials included few patients who had a causative occlusion of an intracranial artery other than the internal carotid artery or the first segment of the middle cerebral artery. The DAWN (Clinical Mismatch in the Triage of Wake Up and Late Presenting Strokes Undergoing Neurointervention with Trevo) trial used the combination of an NIHSS score of 30 or higher and findings on perfusion CT to select patients who had an onset of stroke 6 to 24 hours earlier.11 The percentage of patients with a score of 0 to 2 on the modified Rankin scale at 90 days was significantly higher among those who underwent mechanical thrombectomy than among those who did not (49% vs. 13%; adjusted difference, 33%; 95% CI, 21 to 44). The DEFUSE (Diffuse and Perfusion Imaging Evaluation for Understanding Stroke Evolution) 3 trial included patients who had an onset of stroke 6 to 16 hours earlier and had a large mismatch between the volume of the core and the volume of the penumbra and a maximum core size as determined by means of perfusion CT or diffusion-weighted MRI with an NIHSS score of 6 or higher.22 Tenecteplase is a tissue plasminogen activator that is modified to be more fibrin-specific and more resistant to plasminogen activator inhibitor and to have a longer plasma half-life than alteplase so that it can be given as a single intravenous bolus. A meta-analysis of five randomized, controlled trials that compared tenecteplase with standard-dose alteplase for the treatment of acute ischemic stroke showed no significant difference between the two agents with respect to the percentage of patients who died or had a stroke or a death within 90 days if 0 or 1 on the modified Rankin scale at 90 days (58.2% vs. 55.6%; odds ratio, 1.17; 95% CI, 0.95 to 1.44).22 Conclusions regarding the relative efficacy of tenecteplase are limited owing to the absence of a rigorous, generalizable, head-to-head trial with a primary clinical end point, heterogeneity among the trials with respect to the characteristics of the enrolled patients and the tenecteplase doses, the inclusion of multiple outcomes leading to an increased risk of type I error, and wide confidence intervals in the individual trials.

Antithrombotic Agents
In patients who receive intravenous alteplase, administration of an antplatelet agent is generally recommended to reduce the risk of recurrent stroke or death in the hospital.21 The percentage of patients who received aspirin (at a dose of 160 to 300 mg administered within 48 hours after acute ischemic stroke) than with placebo (8.2% vs. 9.1%, P=0.001).23 In patients with an NIHSS score of 0 or 1 on admission and no indication for mechanical thrombectomy, the percentage of those who had a subsequent stroke (ischemic or hemorrhagic) over 90 days was lower with a 21-day course of dual-antiplatelet treatment than with clopidogrel alone (8.2% vs. 11.2%; hazard ratio, 0.74; 95% CI, 0.56 to 0.98). The most appropriate blood-pressure targets before, during, and after mechanical thrombectomy for those who did not receive alteplase; and managed care.12 The most appropriate blood-pressure targets before, during, and after mechanical thrombectomy for those who did not receive alteplase; and managed care.12

Guidelines for the management of acute ischemic stroke before and during hospitalization, including the use of mobile stroke units—ambulances equipped with CT scanners, in which on-board physicians or physicians available by telemedicine can use CT results to make decisions about intravenous thrombolysis or transport.12 Other uncertainties include the efficacy of mechanical thrombectomy within 6 hours after the onset of stroke in patients who have a causative occlusion of an intracranial artery other than the internal carotid artery or the first segment of the middle cerebral artery, a pre-stroke NIHSS score of 10 or higher and findings on perfusion imaging, and the percentage of patients on the modified Rankin scale, an ASPECTS value of lower than 6, or an NIHSS score of lower than 6; appropriate transfusion requirements; and delay in starting reperfusion. The most appropriate blood-pressure targets before, during, and after mechanical thrombectomy for those who did not receive alteplase; and managed care. The most appropriate blood-pressure targets before, during, and after mechanical thrombectomy for those who did not receive alteplase; and managed care. The most appropriate blood-pressure targets before, during, and after mechanical thrombectomy for those who did not receive alteplase; and managed care.12

G U I D E L I N E S
Guidelines for the management of acute ischemic stroke have been published by professional organizations in the United States, Europe, Canada, and the United Kingdom.17-25 All the guide-
The patient in the vignette has a disabling acute ischemic stroke in the territory of the left middle cerebral artery. Because the patient is within the 4.5-hour treatment window for standard intravenous alteplase and has no contraindications, he should receive intravenous alteplase immediately. If the patient has an occlusion of the internal carotid artery or the first segment of the middle cerebral artery, he should proceed immediately to undergo mechanical thrombectomy. Because the patient is within the 6-hour treatment window, no further neuroimaging is necessary. If there is a proximal occlusion in one of the main arterial branches off the first segment of the middle cerebral artery, thrombectomy may be reasonable because of the disabling nature of his deficit. The blood pressure should be maintained below 180/105 mm Hg. The patient should be admitted to an intensive care unit or specialized stroke unit for close neurologic monitoring and blood-pressure control if needed.

**CONCLUSIONS AND RECOMMENDATIONS**

The patient in the vignette has a disabling acute ischemic stroke in the territory of the left middle cerebral artery. Because the patient is within the 4.5-hour treatment window for standard intravenous alteplase and has no contraindications, he should receive intravenous alteplase immediately. CTA or MRA should be performed. If this cannot be done on site, the patient should be rapidly transferred to a hospital with resources to perform mechanical thrombectomy. If the patient has an occlusion of the internal carotid artery or the first segment of the middle cerebral artery, he should proceed immediately to undergo mechanical thrombectomy. Because the patient is within the 6-hour treatment window, no further neuroimaging is necessary. If there is a proximal occlusion in one of the main arterial branches off the first segment of the middle cerebral artery, thrombectomy may be reasonable because of the disabling nature of his deficit. The blood pressure should be maintained below 180/105 mm Hg. The patient should be admitted to an intensive care unit or specialized stroke unit for close neurologic monitoring and blood-pressure control if needed.

**Figure 2 (facing page). Stepwise Algorithm for Initial Management of Acute Ischemic Stroke in Adults.** All inclusion and exclusion criteria for the specific therapeutic indication should be verified before treatment is instituted. By convention, the time of stroke onset is established as the time that the patient was last known to be well (i.e., in a normal or baseline state, as confirmed by medical history). CTA denotes computed tomography, CTA computed tomography angiography, DAWN Clinical Mismatch in the Triage of Wake Up and Late Presenting Strokes Undergoing Neuroradiology with Tissue, DEFUSE Diffusion and Perfusion Imaging Evaluation for Understanding Stroke Evolution, ICH intracerebral hemorrhage, IV intravenous, MRA magnetic resonance angiography, and NIHSS National Institutes of Health Stroke Scale.
Clinical Practice

No potential conflict of interest relevant to this article was reported.

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<th>Closing Date</th>
</tr>
</thead>
<tbody>
<tr>
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<td>September 18</td>
</tr>
<tr>
<td>October 15</td>
<td>September 25</td>
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<td>October 22</td>
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Yale SCHOOL OF MEDICINE
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Full-time faculty positions are available at the level of Assistant Professor in the Department of Internal Medicine at the Yale University School of Medicine. Applicants should have an M.D., or M.D./Ph.D., training in infectious diseases, HIV Medicine, and an exceptional potential for a career in academic medicine. Candidates are expected to provide independent, high-impact research in infectious-disease consultations and outpatient HIV care. In addition, candidates are anticipated to either (a) establish an independent, extramurally funded research program, or (b) primarily participate in the clinical and educational activities of the section. Review of applications will begin immediately and will continue until the positions are filled.

Full-time faculty positions are available at the level of Assistant Professor in the Section of Infectious Diseases in the Department of Internal Medicine at the University of Maryland School of Medicine. The position will involve teaching and research responsibilities. We are seeking candidates with training in infectious diseases, and the ability to work effectively in a team setting. Expected faculty rank is Assistant Professor or higher. Small town, rural setting and status salary will be commensurate with the selected candidate’s qualifications and experience.

UMMC is a referral center for the most critically ill patients in the Mid-Atlantic region and is proud to have trained generations of new UMMC physicians. Fellows are eligible to sit for the American Board of Internal Medicine in Infectious Disease after completion of fellowship. UMMC is an equal opportunity/affirmative action employer.

Yale University is an affirmative action, equal opportunity employer. Applications from women, persons with disabilities, protected veterans, and members of minority groups are encouraged.

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Where work and life balance.

The Division of General Internal Medicine at the University of Maryland School of Medicine is recruiting for a full time academic career with a focus on teaching and research responsibilities. The position is available at the assistant professor level. The position is uniquely suited for a clinician-scientist with an interest in sleep medicine. The Division of General Internal Medicine is one of the largest and most respected divisions within the Department of Medicine at the University of Maryland School of Medicine. The position will involve teaching and research responsibilities. We are seeking candidates with training in infectious diseases, and the ability to work effectively in a team setting. Expected faculty rank is Assistant Professor or higher. Small town, rural setting and status salary will be commensurate with the selected candidate’s qualifications and experience.

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IU Health is Indiana’s largest and most comprehensive healthcare system, nationally ranked for 23 years in a row and comprised of 16 hospitals, more than 70 physician specialty groups and 2,000 providers at 175 locations. Our partnership with IU School of Medicine gives you access to leading-edge medicine and research to meet the unique needs of every patient.

We’re looking for physicians who are inspired by challenging and meaningful work for the good of every patient. Are you ready to join the team that’s changing healthcare for the better? Apply today at luhealthrecruitment.org.

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Experience the relief of practicing with a large, integrated health system that offers its physicians a financially stable environment, resources and support to provide excellent patient care, and dedication to physician well-being unmatched in the industry. As Banner Health continues to grow, we are hiring physicians in these specialties: HOSPITALISTS | PRIMARY CARE | PALLIATIVE CARE | GASTROENTEROLOGY | DERMATOLOGY | NEUROLOGY | NEUROSURGERY and TRAUMA SURGERY. This is a great career move for those interested in innovative environments with opportunity for balance and development. Join Banner Health and enjoy quality care for your patients and quality time with those that you love!

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Prof Andrew Zhu
Executive Director of Jiahui International Cancer Center
Professor of Medicine, Harvard Medical School

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The 130th Anniversary
Qilu Hospital of Shandong University

HEALING THE PEOPLE
PURSUING THE TRUTH OF SCIENCE

Jinan, the capital city of Shandong province, has been nurtured by natural springs since ancient times. On this fertile land with a splendid history, Qilu Hospital of Shandong University has achieved great accomplishments of glorious development, during which its vigorous and profound culture has been passed down from generation to generation. The spirit of healing the people and pursuing the truth of science germinated here and has remained unshaken ever since. For 130 years, QLH has stayed true to its original aspiration, and dedicated to curing the sick and rescuing the dying, fulfilling its commitment to medical ethics and professional excellence.

QLH is a hospital directly affiliated to Shandong University, a key national university under the direct jurisdiction of the Ministry of Education (MOE) and under the administration of the National Health Commission (NHC), China. Founded in 1890, the hospital was successively called Sino-American Hospital, Union Hospital, Cheloo Hospital, and Affiliated Hospital of Shandong Medical University. In October 2000, it was renamed Qilu Hospital of Shandong University. In recent years, taking Shandong province as the foothold, QLH has been aiming to become a high-level research oriented hospital that is first-class in China and renowned in the world. Based in Jinan and Qingdao, the hospital has formed a development pattern of “three campuses in two cities” with a total of 5,000 beds and nearly 10,000 employees.

QLH is responsible for constructing one of the first regional medical centers built jointly by the NHC and provincial government at the national level. It also conducts the task of Intensive Care Medicine part in the national program of improving Diagnosis and Treatment of Difficult and Complicated Diseases. Now, QLH has 68 clinical and supportive departments, of which six (Emergency Medicine, Rehabilitation Medicine, Obstetrics and Gynecology, Neurosurgery, Haematology, and Clinical Laboratory) ranked among the top 10 in China’s Medical Specialties Ranking 2019, nine others (Gastroenterology, Pathology, Otolaryngology, Endocrinology, Neurology, Cardiology, Geriatrics, Ultrasound Medicine, and Health Management) were nominated.

The Clinical Research Center of Shandong University built by QLH focuses on prevention, diagnosis, treatment, and prognosis of serious diseases. It facilitates the promotion of clinical disciplines through synergistic innovation in clinical research, incubation of key projects, and transformation of research achievements. The strengths of Shandong University as a comprehensive university are fully utilized to enhance interdisciplinary integration between medicine and other disciplines including engineering, sciences, social science and liberal arts. The planned 10,000m² clinical research center (on the International Medical Center campus) will be built into an ideal platform for clinical research transformation with Qilu Medicine’s typical characteristics.

Since its beginning, QLH has been pursuing excellence and innovation by fully using the advantages of outstanding talents, significant technical impact in the region, and a strong brand effect at home and abroad. The hospital has continuously made contributions to the development of medicine in China as well as the health and welfare of the Chinese people.

The Department of Cardiology of Qilu (Cheeloo) Hospital has been the earliest cardiovascular discipline in China and serves as a comprehensive platform for clinical practice, teaching, research and training. This department consists of outpatient clinics, three inpatient wards, a critical care unit (CCU), an echocardiographic laboratory, an electrophysiological laboratory, four cardiac catheterization laboratories, the Key Laboratory of Cardiovascular Remodeling and Function Research of the MOE and the NHC, and a branch department at Qingdao Campus. Subspecialties at the Department of Cardiology include coronary artery disease and atherosclerosis, cardiac arrhythmias, heart failure, stress cardiomyopathies, and pulmonary vascular diseases, hypertension, critical cardiovascular diseases, cardiovascular imaging, and electrophysiology, which are led by nationally renowned experts and professionals and play a vital role in the diagnosis and treatment of critical and complex cardiovascular diseases in Shandong Province and east China. Department members pioneered exercise electrocardiography, stress echocardiography, Doppler echocardiography, multiple transseptal echocardiography, and three-dimensional echocardiography in China. Moreover, this department was in the early rank to develop the following techniques in China: cardiac pacing and cardioversion, thrombolysis for acute myocardial infarction, percutaneous coronary intervention, percutaneous closure for atrial septal defect, ventricular septal defect and patent ductus arteriosus, and radiofrequency and cryoablation ablation for tachyarrhythmias. The Department of Cardiology of Qilu (Cheeloo) Hospital has been conferred National Key Discipline by MOE, and National Key Clinical Specialty and Training Bases for Interventional Diagnosis and Treatment of Coronary Heart Disease, Congestive Heart Diseases and Anhythmias by NHC. In addition, this department was awarded the Innovative Research Group Fund by the National Natural Science Foundation of China.

The Department of Cardiology features research on the mechanisms, detection techniques and intervention strategies of cardiovascular remodeling. Under the leadership of Professor Yun Zhang, the department director and a member of the Chinese Academy of Engineering, the department has undertaken more than 250 national and provincial research projects and published more than 1,200 papers in high-impact international journals. In the field of basic research, this department was the first to establish a series of animal models of atherosclerotic vulnerable plaques, discovered multiple novel genes and mechanisms underlying the development and progression of vulnerable plaque and ventricular remodeling, developed new biomarkers and imaging techniques for detecting vulnerable plaque and ventricular remodeling, and revealed a series of new therapeutic targets for the early intervention of atherosclerosis and heart failure. In the field of clinical research, the department led the world-renowned EMINCA and CAPITAL studies, participated in over 30 international and national multi-center clinical trials, led or participated in the preparation of more than 20 Chinese and international clinical guidelines. Over the years, Department of Cardiology of Qilu (Cheeloo) Hospital has ranked number four to six in the Ranking of China’s Hospital Science and Technology Influence issued by the China Academy of Medical Sciences.

Cardiology
A GUARDIAN OF CARDIOVASCULAR HEALTH

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As one of the first emergency departments established in China, the Department of Emergency Medicine of Qilu Hospital has become a front-runner in emergency and critical care medicine in the country under the leadership of Professor Yugu Chen, president of the ninth committee of Chinese Society of Emergency Medicine and president of Qilu Hospital. In 2019, it ranked third in China's research on chest pain—making correct triage and scientific decision-making with regard to acute cardiovascular diseases. It has been leading the national epidemiological survey of cardiac arrest: the BASIC Registry, which is the first large-scale cardiac arrest registry system covering all provinces in China. A series of research results were published in European Heart Journal, JAMA Cardiology, and other academic journals.

The Department of Neurosurgery now ranks ninth nationwide in terms of comprehensive strength (China's Medical Specialties Rankings 2019). It provides diagnosis and treatment of all neurological disorders across a wide range of specialties, including brain tumors, craniofacial disorders, spinal and peripheral nerves, and muscles. The Department of Neurology and Research Institutions in China, informing health management and clinical decision-making with regard to acute cardiovascular diseases. Moreover, it has been leading the national epidemiological survey of cardiac arrest: the BASIC Registry, which is the first large-scale cardiac arrest registry system covering all provinces in China. A series of research results were published in European Heart Journal, JAMA Cardiology, and other academic journals.

The Department of Physiotherapy at Qilu Hospital was established after the establishment of the Department of Emergency Medicine of the hospital, which was the first in the world to report the therapy of balloon imaging combined with CT-guided biopsy using both the upper esophageal sphincter, benefiting patients with unsolved disease caused by scirrhous esophageal obstruction. The department is dedicated to the rehabilitation of the injured and disabled with system dysfunctions, helping them restore functions, providing novel theories and targets for the prevention and treatment of acute and critical cardiovascular diseases. It has conducted cohort studies about precise risk assessment and prognostic prediction of ACS, and created a biomarker-based ischemia and bleeding risk assessment system targeting patients with acute cardiovascular diseases in China, informing health management and clinical decision-making with regard to acute cardiovascular diseases. Moreover, it has been leading the national epidemiological survey of cardiac arrest: the BASIC Registry, which is the first large-scale cardiac arrest registry system covering all provinces in China. A series of research results were published in European Heart Journal, JAMA Cardiology, and other academic journals.

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Moreover, the departments also revealed the underlying molecular mechanisms and provided planning textbooks, oversaw the establishment of several guidebooks, and lead in making several guidelines and regulations. For example, the department lead in making several guidelines and regulations for glioblastoma diagnosis and treatment, as well as neurological rehabilitation. The Department of Physiotherapy at Qilu Hospital was established after the establishment of the Department of Emergency Medicine of the hospital, which was the first in the world to report the therapy of balloon imaging combined with CT-guided biopsy using both the upper esophageal sphincter, benefiting patients with unsolved disease caused by scirrhous esophageal obstruction. The department is dedicated to the rehabilitation of the injured and disabled with system dysfunctions, helping them restore functions, providing novel theories and targets for the prevention and treatment of acute and critical cardiovascular diseases. It has conducted cohort studies about precise risk assessment and prognostic prediction of ACS, and created a biomarker-based ischemia and bleeding risk assessment system targeting patients with acute cardiovascular diseases in China, informing health management and clinical decision-making with regard to acute cardiovascular diseases. Moreover, it has been leading the national epidemiological survey of cardiac arrest: the BASIC Registry, which is the first large-scale cardiac arrest registry system covering all provinces in China. A series of research results were published in European Heart Journal, JAMA Cardiology, and other academic journals.

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The department was among the country’s earliest to offer a doctoral program in obstetrics and gynecology. The discipline was listed in the second batch of national key disciplines and the first batch of national key clinical specialties. Ranked in China’s top 10, the team played a key role in editing the national-planned textbook Obstetrics and Gynecology, and in sponsoring Progress in Obstetrics and Gynecology, one of China’s core journals.

The team consists of 120 obstetricians and gynecologists who specialize in gynecological oncology, general gynecology, family planning, perinatal medicine and reproductive medicine, with gynecological oncology being a national key discipline. Clinically, these physicians treat about 1,500 female patients with malignant tumors in primary management every year — the five-year survival rate for ovarian cancer recently reached 50% — which is one of the highest in the world.

They have developed the Diagnosis Criteria for Cervical Cancer, the national health standard, for the NHC, and have led the development of several guidelines and expert consensus documents for the diagnosis and treatment of gynecological oncology. It also established the world’s first ultra-fast approach to identifying cervical lesions.

The focal points of team members’ research include the pathogenesis, early diagnosis, and comprehensive therapy of gynecological tumors. They have suggested several innovative theories, such as “low-grade serous ovarian carcinoma originating from oviducts”, which is included in national-planned textbooks on obstetrics and gynecology as well as guidelines for the diagnosis and treatment of gynecological tumors. In the last decade, team members have undertaken more than 100 national-level research projects, leading to over 200 international publications and 30 national invention patents.

The Clinical Laboratory of Qilu Hospital is a pioneer in this field in China. Laboratory Diagnostics, the first textbook of its kind, was published in 1921 by Fu lin Yu, an expert who developed the world renowned Yu’s Ring Test for urolithiasis diagnosis in 1935. As a National Key Clinical Specialty, it acts as a regional provider of medical services and basic training, and it plays an important role in editing textbooks of laboratory medicine and materials for standardized residents training.

Exploring Frontiers and Serving Patients

Gastroenterology

Ranged as one of the first national key clinical specialties, the Department of Gastroenterology has been at the forefront of this branch of medicine. In the field of endoscopic microsurgery, the department has established the diagnostic criteria for gastric cancer and precancerous lesions, dubbed the Qilu Criteria, which is the only technical standard named by a Chinese institution that has been adopted by the global endoscopy community. The team maintains close collaborative research relationships with industry to use endoscopic tools in the diagnosis and treatment of early gastrointestinal cancers, and it works toward the development and application of artificial intelligence diagnostic tools and robots for minimally invasive endoscopic surgery. These efforts, supported by the National Key Research and Development Program, have made important achievements, some of which are widely applied in primary hospitals. It leads the country in performing endoscopy in patients with inflammatory bowel disease (IBD). It has established the country’s first Center for Micro-ecology Research, Diagnosis and Treatment at the provincial level, and it has been given the approval to build a national IBD center for the region. It has also shed light on the neuro-immune-endocrine network underlying the abnormal brain–gut interactions in irritable bowel syndrome. The research was funded by the National Natural Science Foundation of China and published in academic journals such as Gut.

Call to Apply for the Director of the NHC Key Laboratory of Otorhinolaryngology of China

Established in 1989 by former Shandong Medical University, the NHC Key Laboratory of Otorhinolaryngology is currently managed by Qilu Hospital of Shandong University. The 3,000m² laboratory is equipped with the best facilities of the nation to support studies in molecular biology and molecular epidemiology. Based on its abundant clinical resources, the laboratory has established the largest biobank of head and neck tumors in Shandong Province, providing clinical cases for basic and clinical translational research of head and neck tumors.

The laboratory is now recruiting a director. If you are interested, please email us at qlyyscl@126.com or call +86-531-82169026.
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