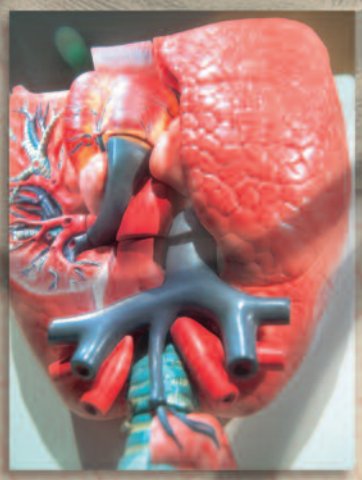
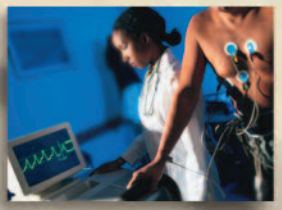
AMERICAN

CAREERS®







HEALTH CAREERS PROGRAM

Occupation	Percent Change 2006-2016
Management, business and financial occupations	18.2
Medical and health services managers	18.6
Counselors	29.3
Social workers	23.3
Social and human service assistants	28.9
Pharmacists	22.2
Physicians and surgeons	17.1
Physician assistants	29.6
Registered nurses	25.2
Occupational therapists	28.4
Physical therapists	30.4
Respiratory therapists	23.4
Clinical laboratory technologists and technicians	14.3
Dental hygienists	30.4
Diagnostic medical sonographers	19.2
Emergency medical technicians and paramedics	22.3
Cardiovascular technologists and technicians	25.5
Licensed practical and licensed vocational nurses	13.4
Medical records and health information technicians	18.6
Home health aides	46.9
Nursing aides, orderlies and attendants	18.3
Physical therapist assistants and aides	29.7
Dental assistants	30.3
Medical assistants	36.1
Cooks, institutional and cafeteria	17.2
Building cleaning workers	17.5
Personal and home care aides	53.0
Bookkeeping, accounting and auditing clerks	20.9
Receptionists and information clerks	22.7
Executive secretaries and administrative assistants	20.6
Office clerks, general	21.5

Find out more about the health services industry at **http://www.bls.gov/oco/cg/cgs035.htm.** Then see your school counselor about high school programs that can help you grow your own health career.

Career academies • Career pathways • Career-technical education
College prep • Cooperative education • Youth apprenticeship

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PUBLISHING
PUBLISHER Barbara F. Orwig
EDITOR IN CHIEF Mary Pitchford
CURRICULUM DIRECTOR Charlotte Davis
EDUCATION CONSULTANT Helen Winter
ART DIRECTOR Jerry Kanabel

ADMINISTRATION
CHIEF EXECUTIVE OFFICER James Dick
PRESIDENT Barbara F. Orwig
BUSINESS MANAGER Pat Graham

EDITORIAL CONTRIBUTORS
Mary Ann DiPietro, Sandra Moran, Dan Rafter, Joan Rhine, Mark Rowh, Patty Williamson, Ph.D., and the Health Occupations Students of America

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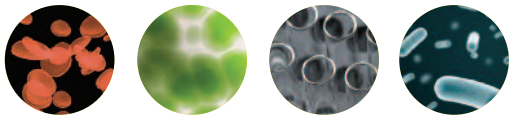


Contents

FUTURE PREP

CAREER PATHWAYS

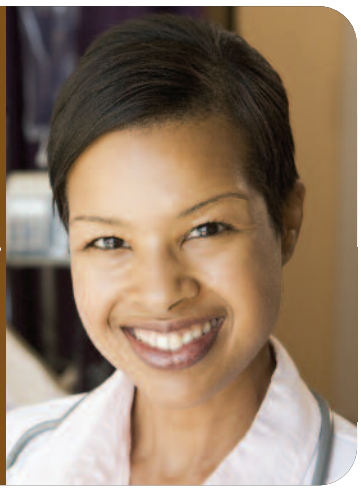
8 Good Reasons

why you need to consider a career in health

Everybody's looking for a great job. You'll want one, too, when you get out of school. That's a major reason to consider a career in health services. Health careers offer the kinds of benefits people want in a job:

1 Opportunities to make a difference in people's lives.

You'll make the quality of life better for people if you choose a health profession. In fact, you may even save lives.



2 Ways to use your high-tech skills.

Health-related businesses rely on technically skilled people to handle administrative tasks, huge databases, finely tuned machines and sophisticated mechanical systems.

3 A chance to start a career with less than a four-year degree.

Some health careers require a bachelor's degree or higher. Many others require just a one-year certificate or two-year associate degree for entry-level employment.

4 Lots of places to work.

Don't just think about hospitals and medical offices. Other employers include temporary staffing services, home health agencies, medical laboratories and treatment centers, government agencies and large companies, outpatient surgical centers and more. You might even consider a sales career. Suppliers of medical devices, medical equipment and supplies, and pharmaceutical companies also hire health professionals.

5 Many job openings.

Look at the newspaper or online career sites. Likely you'll find many more job openings in health than in any other field.

6 Advancement opportunities.

Many health employers provide opportunities to grow in one's career. With more education and experience, you could increase your income and become a manager or a high-level administrator if that's your goal.

7 A choice of hours.

Some health facilities provide around-the-clock care, which means a choice of shifts for employees. With a 12-hour shift, for example, you could work three days on and four days off, followed by four days on, three days off. That's a super schedule for people who want to spend more time with friends and family.

8 Opportunities to travel, learn and do fun things.

What would you do if you had a chance to find a job with a flexible schedule – the kind of schedule many health employers offer? You could see the world, advance your education or take a beach or ski break. Want to try out life in different parts of the country? Health jobs are available throughout the nation.

BRIGHT? CURIOUS? AN ON-THE-GO KIND OF PERSON?

If those terms, plus words like "honest" and "dependable," describe you, there's a good chance for success in a health career. However, success in any health career also demands command of basics like these:

- A strong academic foundation
- Good oral and written communication skills
- Knowledge of how one's job fits into the bigger system
- Employability skills, or skills needed to succeed and advance in a career
- Legal responsibilities related to one's job and to clients
- Ethical practices related to giving care
- Safety practices
- Teamwork ability
- Health maintenance practices, or how to stay well and prevent disease
- Technical skills
- Information technology applications related to one's job

EXPLORE

THE HEALTH SCIENCE CAREER CLUSTER

The health science career cluster has five career pathways. Those include:

- Therapeutic services
- Diagnostic services
- Health informatics
- Support services
- Biotechnology research and development

Explore the five pathways, and you'll discover jobs for "people persons" who treat patients and diagnose health problems. You'll also discover jobs for men and women who have business, technical and scientific interests and skills.

To find job titles along each of these pathways, go to **http://www.careertech.org**. Under "Career Clusters," click on "Resources for Career Cluster Models," then "Career Cluster Career Frames," then "Health Science."

When you've picked out some interesting job titles, go to **http://www.bls.gov/oco/home.htm** and access the A-Z index. To explore the health industry, go to **http://www.bls.gov/oco/cg/cgs035.htm**. Then go to **http://www.onetonline.org** to find lists of skills and links to salary and education information.

In addition to these government-sponsored sites, go to **http://healthpronet.org**. Also go to **http://www.healthscienceconsortium.org**. It's the website of the National Consortium on Health Science & Technology Education. Click on "National Standards" and "Foundation" or "Pathway" to learn more.

To find a sample plan of study, go to **http://www.careertech.org**. Under "Career Clusters," click on "Resources for Career Clusters," then "Plans of Study," then "Health Science." Likely you'll find that there's a health career for you.

Find out if you have ...

A FUTURE IN HEALTH CARE

Psychologist John Holland studied the problem of making career choices. He concluded that people are drawn to certain career interests according to their personality types. He identified six general types and designed a national career guidance exam to help people make the right choices. Our checklist is similar to Holland's work. It will help you size up your career interests and how these might relate to a health career. Follow these three steps:

1. Make an inventory of your interests.

Not everybody falls into just one type, Holland explains. You may have the character traits and interests of two or even three personality types. But chances are you belong to one general type more than the other five. After all, there are certain activities you'd rather do than anything else, right? When you discover a pattern to your interests, you end up with a focus for your career future.

2. Add up your scores.

You'll see a pattern that will help you to evaluate your career-related personality type.

3. Evaluate yourself.

When you have determined the one or two types that seem to best represent you, turn to pages 6 and 7. Study the career information related to your top two personality types. You'll find some specific health careers you might want to explore.

1. MAKE AN INVENTORY OF YOUR INTERESTS.

Check the activities or career fields that interest you, whether you know much about them or not.

1. Work on a farm or help save a rainforest ○	**25.** Work outside in a national park ○
2. Solve complicated math problems ○	**26.** Research a law case ○
3. Act in a movie or play ○	**27.** Play a musical instrument ○
4. Study social groups in society ○	**28.** Work with babies or children ○
5. Interview strangers for the TV news ○	**29.** Run for class office ○
6. Learn about and study the economy ○	**30.** Work after school to save money ○
7. Study "how-to" mechanics manuals ○	**31.** Set up a sound system ○
8. Perform science lab experiments ○	**32.** Read science fiction ○
9. Manage an art gallery ○	**33.** Write a short story, play or novel ○
10. Conduct a religious service ○	**34.** Entertain at a party ○
11. Bargain at a flea market ○	**35.** Work in a politician's office ○
12. Write up graphs or charts with statistics ○	**36.** Enter documents into computers ○
13. Build cabinets or furniture ○	**37.** Build a jet aircraft model ○
14. Study nature outdoors or trace the effects of pollution on the environment ○	**38.** Use an electron microscope or high-tech medical instrument ○
15. Write a movie screenplay ○	**39.** Design a new line of clothes ○
16. Lead a club or scout troop ○	**40.** Read and discuss literature ○
17. Buy merchandise for a store ○	**41.** Debate political and social issues on TV ○
18. Work nine to five in a corporate office ○	**42.** Keep accurate records of a business ○
19. Operate heavy machines ○	**43.** Repair a car engine ○
20. Play chess ○	**44.** Identify constellations of stars ○
21. Work on an art or a music magazine ○	**45.** Take pottery classes ○
22. Get involved in a charity or community organization ○	**46.** Work with senior citizens ○
23. Do fast-paced, high-pressure sales work ○	**47.** Sell products on commission ○
24. Design computer games and programs ○	**48.** Set up a budget for running a large company or government agency ○

2. ADD UP YOUR SCORES.

Below, circle the numbers you checked off. Count the number of circles in each line. Then put that total number of circles in the blank space at the end of each line.

PERSONALITY TYPES									TOTAL
a.	REALISTS	1	7	13	19	25	31	37	43	
b.	INVESTIGATORS	2	8	14	20	26	32	38	44	
c.	ARTISTS	3	9	15	21	27	33	39	45	
d.	HELPERS	4	10	16	22	28	34	40	46	
e.	ENTERPRISERS	5	11	17	23	29	35	41	47	
f.	DETAILERS	6	12	18	24	30	36	42	48	

3. EVALUATE YOURSELF.

In what two personality types did you score the highest? Write their names in the blank spaces below.

HOW CAN KNOWING YOUR PERSONALITY TYPE LEAD YOU TO A SATISFYING CAREER FUTURE? READ ON ...

a. REALIST

If you love working with your hands, chances are you're a realist. You like to build and fix things. Using tools comes naturally. You may prefer solving concrete rather than abstract problems. Many realists, including professionals like these, grow up to have "hands-on" careers:

Therapeutic Services
Athletic trainer
Chiropractor
Dentist
Dental hygienist or assistant
Dietitian
Dental laboratory technician
Emergency medical technician
Home health aide
Nurse or nursing assistant
Occupational therapist
Optician
Paramedic
Physical therapist
Radiation therapist
Respiratory therapist
Surgeon
Surgical technician
Veterinarian
Veterinary technician

Diagnostic Services
Dentist
Occupational therapist
Ophthalmologist
Optometrist
Physical therapist
Physician
Respiratory therapist
Veterinarian

Health Informatics
Community services specialist
Medical assistant
Social worker

Support Services
Biomedical technician
Environmental health and safety manager
Facilities manager
Hospital maintenance engineer

Biotechnology Research and Development
Biomedical engineer
Clinical laboratory technologist
Medical researcher
Quality assurance technician

b. INVESTIGATOR

Investigators are observant and curious. They have a feel for gathering and figuring out information. Many love science, math or history. They may prefer to work more on their own than with others. Does that sound like you? Perhaps you'd like to be one of these professionals:

Therapeutic Services
Forensic nurse
Pharmacist
Physician
Veterinarian

Diagnostic Services
Histotechnologist
Pathologists' assistant
Physician
Radiologic technologist
Radiologist
Speech pathologist
Veterinarian

Health Informatics
Computer security specialist
Data analyst
Epidemiologist
Health writer
Medical librarian
Medical video producer

Support Services
Biomedical technician
Environmental health and safety manager
Hospital maintenance engineer

Biotechnology Research and Development
Biochemist
Geneticist
Medical researcher
Toxicologist

c. ARTIST

Artists are creative, imaginative and like to express themselves. They may work with words and pictures or music and dance. They also may work with materials and machines that produce artistic products. The following may be a way to use your artistic talents:

Therapeutic Services
Athletic trainer
Art therapist
Dance therapist
Music therapist
Dental laboratory technician
Occupational therapist
Orthodontist
Orthotist
Plastic surgeon
Prosthetist
Prosthodontist

Diagnostic Services
Orthotist
Plastic surgeon
Prosthetist
Prosthodontist

Health Informatics
Hospital or health agency public relations director
Medical editor or reporter
Medical illustrator or photographer

Support Services
Cook, institutional and cafeteria
Food services worker

Biotechnology Research and Development
Biomedical communicator
Medical illustrator
Robotics engineer

FIND A HEALTH CAREER THAT RESPONDS TO YOUR MANY INTERESTS

Did you have similar scores in more than one personality category? You've just discovered something about yourself. Like many people, you have more than one interest and more than one facet to your personality.

Many health careers appeal to people like you. That's why you see some health careers repeated in more than one column. That's also why it's a good idea to think about how you can combine careers to create your special opportunity.

d. HELPER

Helpers are expert communicators. They work well in groups and interact well with all kinds of people. Do you see yourself working on a health care team? Can you imagine teaching people new skills or helping them with health problems, like these professionals?

Therapeutic Services
Athletic trainer
Emergency medical technician
Forensic nurse
Home health aide
Nurse or nursing assistant
Nutritionist
Occupational therapist
Optician
Paramedic
Physical therapist
Physician
Psychiatrist
Psychologist
Respiratory therapist
Veterinarian
Veterinary technician

Diagnostic Services
Ophthalmologist
Optometrist
Physician
Psychiatrist
Psychologist
Veterinarian

Health Informatics
Admitting clerk
Billing office representative
Clinical department director
Community services specialist
Health educator
Hospital chaplain
Medical assistant
Patient advocate
Social worker

Support Services
Biomedical technician
Food service worker
Maintenance/repair technician
Transport technician

Biotechnology Research and Development
Biomedical engineer
Geneticist

e. ENTERPRISER

Do you have strong leadership qualities? Can you organize and prioritize? Are you competitive, a risk-taker? Can you persuade others to see things your way? Enterprisers have the social skills of helpers and the hands-on skills of doers like these:

Therapeutic Services
Community health service provider
Gerontology service provider
Medical practice owner or partner
Personal trainer
Specialized surgical clinic owner/operator
Visiting nurse

Diagnostic Services
Consulting nutritionist
Geneticist
Laboratory owner or operator
Medical practice owner or partner

Health Informatics
Applied researcher
Fund-raising director
Health educator
Hospital or health agency executive director
Risk management consultant

Support Services
Financial, marketing, human resources, other top manager
Medical equipment entrepreneur
Pharmaceutical distributor

Biotechnology Research and Development
Biomedical patent attorney
Laboratory owner or operator
Medical scientist
Pharmaceutical scientist
Private research laboratory owner

f. DETAILER

Detailers have great focusing skills. They analyze facts and numbers. They're observant and able to evaluate what they perceive. They often prefer a steady routine. They like being part of a team, though not always in leadership roles. The health services career cluster has many careers for detailers like these:

Therapeutic Services
Dental laboratory technician
Forensic nurse
Pharmacist
Pharmacy technician

Diagnostic Services
Laboratory technician
Medical staff administrator
Medical technologist
Pathologist or medical examiner

Health Informatics
Accountant
Administrative assistant
Admitting clerk
Coder
Epidemiologist
Health information technician
Insurance clerk
Medical illustrator
Medical records manager
Medical secretary
Transcriptionist

Support Services
Biomedical technician
Environmental health and safety manager
Facilities manager

Biotechnology Research and Development
Biochemist
Biomedical engineer
Biomedical patent attorney
Geneticist
Medical researcher
Medical scientist
Pharmaceutical scientist
Toxicologist

Make a PERSONAL CONNECTION to health care

Imagine working directly with people who need health care. Some might have hard-to-detect symptoms. Others might require treatments for illnesses or injuries. Still others might need continual care and counseling to maintain their health, manage a long-term disability or deal with end-of-life issues.

If you would like to make a personal contribution to improving health, thousands of therapeutic services jobs await you. Typical careers can be found in nursing, dentistry, medicine and surgery, vision care, pharmacy, physical therapy, radiation technology and more.

Of course, there are several things to consider before choosing careers in therapeutic services or other health pathways:

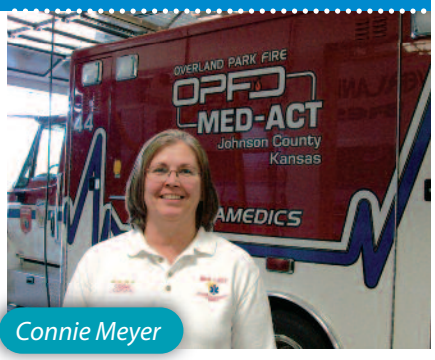
- Health careers require a lifetime commitment to education. Whether you start your career with a one- or two-year certificate or an associate degree or higher, health careers require continuing education to update knowledge and skills and to renew a certificate or license to practice.
- Therapeutic services careers, in particular, demand both physical stamina and a real interest in technology. You'll find yourself in a high-energy, high-tech environment where a day on the job means eight to 12 hours of working with people, computers and medical equipment.
- Patient contact requires excellent communication skills and a caring heart. To understand and respond to patients' needs, you must be able to ask questions, listen, discuss treatments and provide answers with an empathetic, nonjudgmental spirit of concern.

Are you are interested in and able to do all of these things? Then very likely you'll enjoy a career in therapeutic services.

THERAPEUTIC RESEARCH

American Association for Respiratory Care: **http://www.aarc.org/career**
American Association of Colleges of Pharmacy: **http://www.aacp.org;** under "Resources," click on "Student Center"
American Dental Association: **http://www.ada.org**
American Dental Hygienists' Association: **http://www.adha.org/careerinfo/index.html**
American Nurses Association: **http://www.nursingworld.org;** click on "Career & Credentialing"
American Physical Therapy Association: **http://www.apta.org**
American Psychiatric Association: **http://www.psych.org/career_corner/jobbank;** click on "Planning a Career in Psychiatry"
American Psychological Association: **http://www.apa.org;** click on "Education"
Health Care Careers: **http://www.ama-assn.org/ama/pub/education-careers/careers-health-care.page**
How Do You Become a Physician: **http://www.ama-assn.org/ama/pub/education-careers/becoming-physician.page**
National Athletic Trainers' Association: **http://www.nata.org**

CONNIE MEYER
PARAMEDIC



Connie Meyer

Paramedic Connie Meyer is fully capable of handling the big medical emergencies – heart failure, car accidents and the like – but if you were to ask her about the element of her job that leaves her most satisfied, she'd tell you that it's the small, everyday emergencies.

The people who don't last in this career feel they have to have the big calls and save somebody's life every time they go out, and that doesn't happen very often, Meyer explained. So you have to get your satisfaction from small things. Taking care of someone. Helping them out through a small emergency. She gives some examples:

"Someone who's fallen and broken their arm ...

"Or just a grandma who's lonely and doesn't know what else to do so she calls 911. She's alone ...

"Or when you can do the extra little things. Like this morning we had a lady who needed to go to the hospital, but she had her dog there ... So we take time to make sure the dog has food and water and is taken care of."

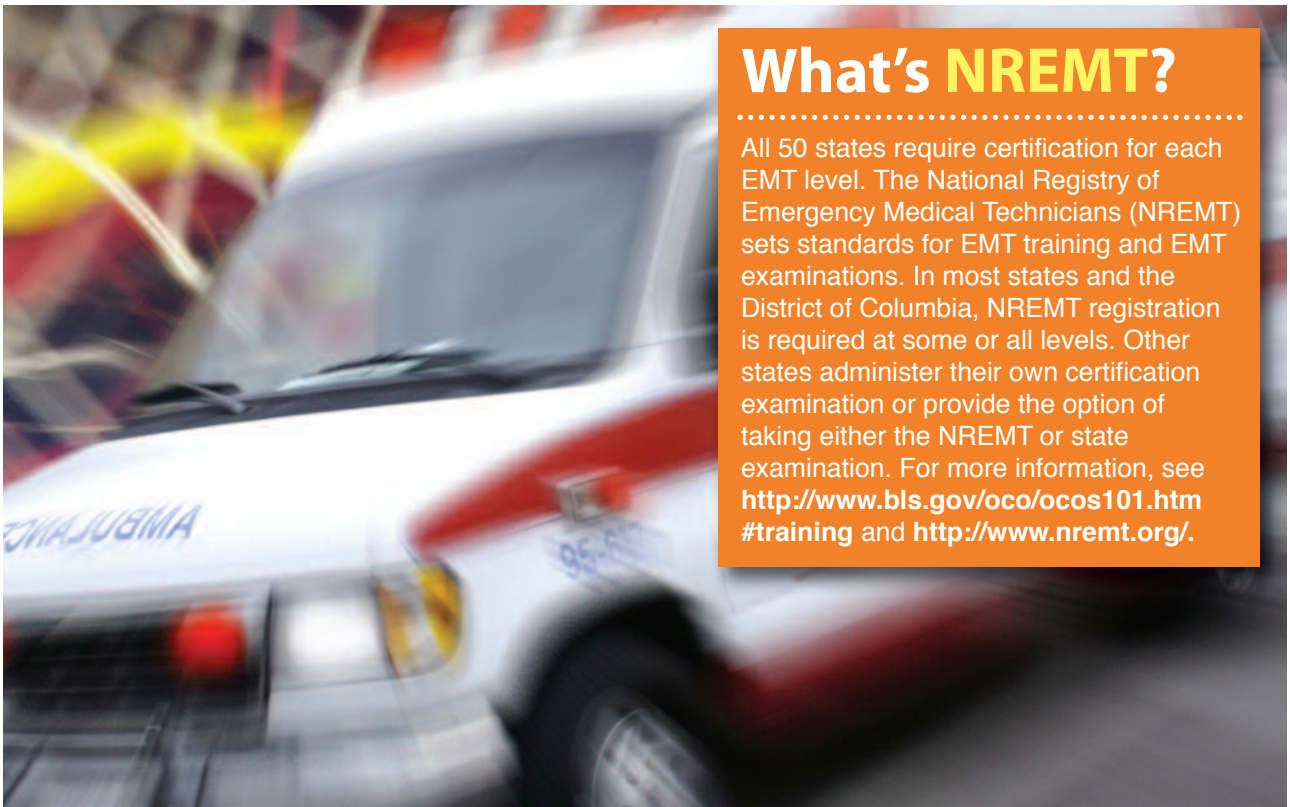
Meyer, a 20-year veteran of the Johnson County Med-Act in Olathe, Kansas, started out as an emergency medical technician (EMT). Using that certification as a springboard, she entered the paramedic program at Johnson County Community College in 1983 and has worked in the field ever since.

Meyer works hard to stay up to date on advancements and changes in the field through constant training.

"That entails either classroom training or hands-on training," she said. "Last month we did pediatric training. And this month we'll finish pediatric, and we may do cardiac or trauma. It's just a variety of things. To keep the national registry (National Registry of Emergency Medical Technicians), you have to do so many hours in different subjects, and part of that has to be hands-on practice."

According to Meyer, patience, critical thinking and good communication skills are a must – as is physical strength and having realistic expectations of the job.

"Burnout is a problem," she said, "especially if you're expecting the wrong thing out of the job, and you're not realistic about what the job involves. It doesn't always involve glory and praise and all of the things you think it might from watching TV." *Sandra Moran*



What's NREMT?

All 50 states require certification for each EMT level. The National Registry of Emergency Medical Technicians (NREMT) sets standards for EMT training and EMT examinations. In most states and the District of Columbia, NREMT registration is required at some or all levels. Other states administer their own certification examination or provide the option of taking either the NREMT or state examination. For more information, see **http://www.bls.gov/oco/ocos101.htm#training** and **http://www.nremt.org/.**

STEVEN SITTIG, RRT
RESPIRATORY THERAPIST


Steven Sittig (upper left)

Steven Sittig's job sends him far above the rooftops of Rochester, Minnesota, and its surrounding suburbs and neighborhoods. Sittig works as a respiratory therapist at the Mayo Clinic, Saint Marys Hospital. He spends much of his time aboard helicopters, operating the ventilators that help young patients breathe as they make their way to surgeons and doctors waiting in the hospital's emergency room below.

A registered respiratory therapist (RRT), Sittig specializes in children and young adults. He makes sure that his patients, whether recovering from surgery, struggling with asthma or flying aboard an emergency helicopter, never stop breathing.

"This is an exciting career," Sittig says. "I work with kids, and a lot of times they come back to see us after they've been released from the hospital. Some of the kids I work with are born prematurely, and you can hold them in one hand when they're born. To see them five or 10 years later, and see that they look perfectly healthy, is a great feeling."

Sittig and other respiratory therapists are important members of the medical team at any hospital. They work alongside the hospital's doctors and nurses to develop care plans for their patients. Respiratory therapists work with a variety of patients. Sittig may spend part of a day helping a premature baby weighing no more than a pound. He may then spend time working with an adolescent suffering from severe asthma. He is also responsible for helping restart patients' breathing in emergencies.

At any time during the day, Sittig may be called from the floor to assist in an emergency transport. His job then is to do everything he can to make sure a patient doesn't stop breathing on the way to the hospital's emergency room.

Before working in the field, respiratory therapists are now required to earn an associate of science degree, a degree that requires two years of college. Many hospitals, though, prefer that their therapists earn at least a bachelor's degree. Because of this, many colleges today offer four-year programs for future respiratory therapists.

Sittig recommends that students interested in this career take as many science and biology courses as possible. He also says that students should take as many advanced math classes as they can.

"This is a growing field," Sittig says. "There are so many areas you can work in. You can work in a hospital. You can work with adults or with children. You can work in a diagnostic lab. You can work in a physician's office or in a home-care setting. You can end up teaching or doing research."

The sky's the limit for Sittig. It could be for you, too. *Dan Rafter*

EARN & LEARN

With an associate degree in respiratory therapy, you can start earning money while your friends are still in college. In fact, you could go on to earn a debt-free, four-year degree with a career in respiratory care, says the American Association for Respiratory Care. Find this information and more at **http://www.aarc.org/career**.

KATIE GRAF
SOCIAL WORKER

When Katie Graf comes to work each morning at Door County Memorial Hospital in Sturgeon Bay, Wisconsin, she never knows exactly what the day will bring, only that it will be busy and never dull. The hospital serves about 22,000 patients a year.

On the job, Graf works with patients and families and with the doctors, nurses, a chaplain, business office personnel, people who work in the four clinics associated with the hospital and local service agency personnel.

In the emergency room, Graf works closely with the chaplain, dealing with families whose patients have died or about whom end-of-life decisions must be made. In the intensive care unit, Graf serves as an advocate for terminal patients whose doctors are recommending additional treatment.

"Sometimes the patients tell me, 'I'm tired. I just want to be kept comfortable,'" Graf said. "There are lots of ethical issues here, but I try to get the doctor to hear the patient."

Graf also deals with discharge planning for hospital patients. She arranges the services they'll need to make a safe transition to their homes or other care centers.

In the four clinics associated with the hospital, she assists patients with legal documents to assure that the treatment they receive in life-threatening situations is what they desire. She also finds help for patients who need home health care, respite care for their caregivers and other services and living expenses.


Katie Graf

Door County has the highest percentage of elderly persons in Wisconsin. Many of them are in need of financial assistance for medical care and living expenses.

In 1999, Katie's Fund was established for this purpose with an $8,000 grant. Since then, much more has been raised to provide community residents with "last resort" help.

"Some days," Graf said, "I feel like Santa Claus! People are so grateful for even a small amount of help."

A certified social worker needs a master's degree, plus 26 hours of continuing education credits every two years. Also, "You need to be a people person," Graf said, "and you can't be afraid of challenges. You have to dive in and ask others to help. You must be a good listener"

"Because I take the time to pull up a chair and really listen to patients, I often see different problems than the ones that are obvious to nurses. Along with the chaplain, we work as a holistic team." *Patty Williamson, Ph.D.*

THERAPEUTIC WORDS

Therapeutic professionals use the following words. See if you can match each word with its definition below. Answers appear on page 20.

A. Incision
B. Vital signs
C. Prescription
D. Callus
E. Respiration
F. Calculus

___1. Instruction related to giving a patient a medication or treatment
___2. Hard deposit on teeth
___3. Thickening of skin often caused by friction
___4. A cut made by a sharp instrument
___5. Act of breathing where the body exchanges oxygen and carbon dioxide
___6. Temperature, pulse and respiration

MICHAEL STEPHANIDES, M.D.
PLASTIC AND RECONSTRUCTIVE SURGEON


Michael Stephanides

Most people think plastic and reconstructive surgeons spend their days giving people smaller noses and tighter tummies. But most of today's plastic surgeons work just as much with accident victims, people who have suffered serious burns or children who were born with severe physical defects.

Doctors such as Michael Stephanides, a plastic and reconstructive surgeon with Centennial Medical Center in Nashville, Tennessee, reconstruct cancer-ravaged noses, erase burn marks from arms and faces and rebuild shattered jaws.

"Happy patients are the true reward in this field," Stephanides says. "That is what keeps us all going. It's fun to see the results of your work after you are done with a surgery. It is the same satisfaction that a carpenter gets when he makes a nice piece of furniture. You always improve things. It's a happy specialty."

No two days are ever the same for Stephanides. He spends one or two days a week seeing patients on whom he has previously operated to make sure they are recovering properly. He spends other days seeing new patients who have been recommended to him by other physicians.

Operating days can be especially long. Stephanides usually starts his surgeries at 7:30 in the morning and keeps on working until he finishes all of his scheduled operations. Some surgeries are short, lasting an hour or two. Others can take much longer, 10 to 12 hours in some cases.

Stephanides also devotes much of his time to research and to developing new technologies. He is now the director of the robotic surgery department at his medical center. In this position, he works with the center's two da Vinci robots. Surgeons control these robots while sitting in control booths away from their patients. Under a surgeon's remote control, the da Vinci robot wields tiny surgical instruments, allowing it to operate on patients without creating the large scars these operations otherwise would leave. Surgeons from across the country travel to Nashville to learn how to use these robots.

"So far we've only scratched the surface with these robots," Stephanides said. "There are so many applications that will be ideal for robotic surgery. We're slowly getting other specialties involved."

Students interested in plastic and reconstructive surgery should know that the field is not an easy one to get into. It requires a bachelor's degree, medical degree, general surgery training, plastic surgery training, internships and at least one year of fellowship work.

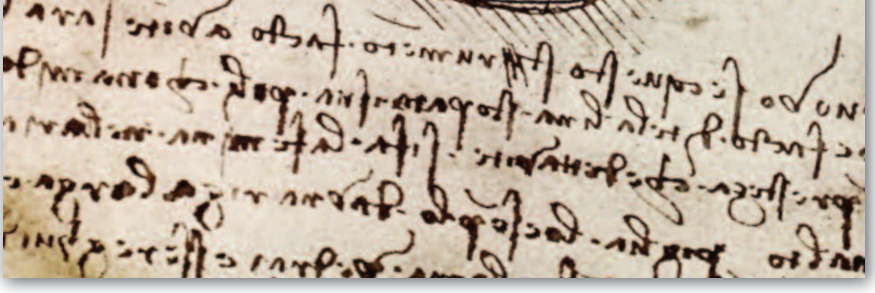
"There is no instant gratification. The training is long and hard," Stephanides said. "But if you like what you are doing, even the long years and many hours you put into it are fun. At the end, you're in a privileged situation where people trust you with their bodies and their lives. You make a difference."

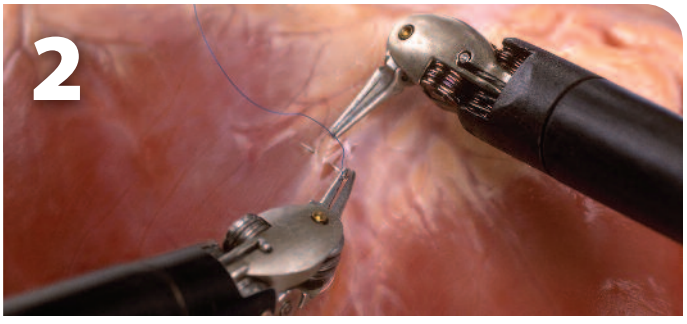
Dan Rafter

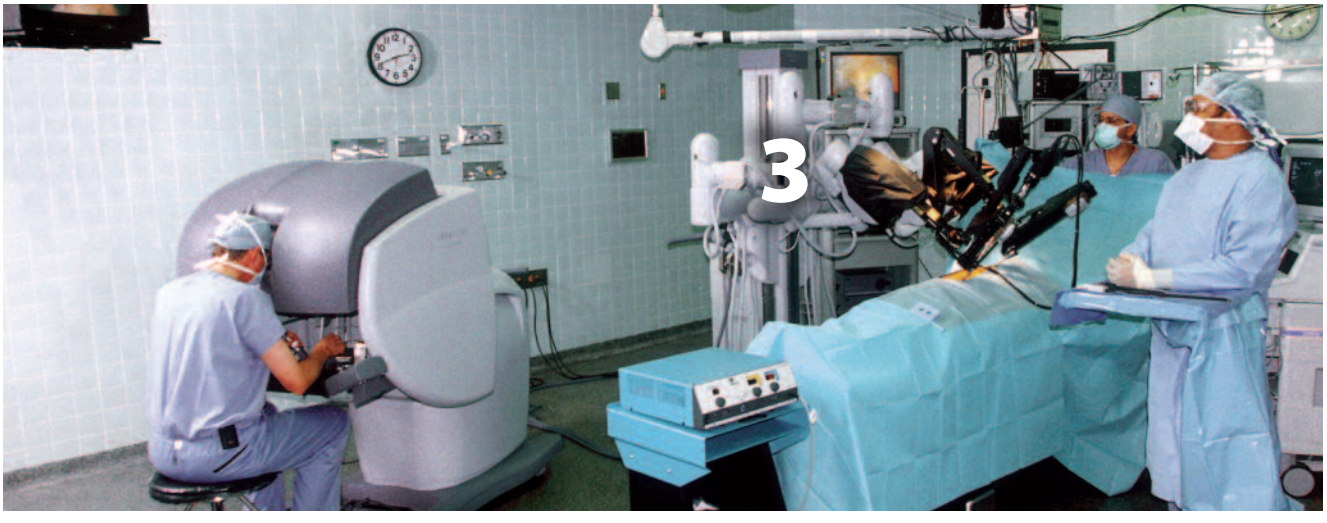
Who is Leonardo da Vinci,
and what does he have to do with robots?

To find out ...

go to http://www.da-vinci-inventions.com/robotic-knight.aspx







Good at Video Games?

Imagine traditional heart surgery.

The surgeon makes a 10- to 12-inch incision in a patient's breastbone to expose the heart and related vessels. That's the typical approach to cardiac surgery. Just about everyone has seen it on TV.

Now follow the photos to picture a new, minimally invasive approach to surgery, robotic-assisted surgery. The surgeon makes only three or four small openings between the patient's ribs. Each opening is about one centimeter wide.

One opening is used to insert a camera-like device (photo 1). It allows the surgeon to see inside the patient and also to see what he or she is doing.

The other openings are used to insert a choice of tiny interchangeable instruments (photo 2).

The camera, called an endoscope, and the instruments, called EndoWrist® Instruments, are housed in the robotic arms on a patient-side cart (photo 3). The patient-side cart stands next to the operating table with its robotic arms extended above the patient.

Seated at a console, the surgeon views the surgical site in 3-D. Then the surgeon uses controllers, called masters, to manipulate the instruments to make needed repairs.

The photos you see show components of the da Vinci® Surgical System developed by Intuitive Surgical, Inc. This surgical robot is used for many kinds of surgery, such as cardiac, pediatric, general and urologic. It's the kind that Dr. Michael Stephanides uses in his work at Centennial Medical Center in Nashville, Tennessee.

In fact, skilled surgeons throughout the world use technology like the da Vinci system robot to reduce pain and complications and get patients going much sooner.

Now imagine yourself at the controls, saving lives, for real. *Photos and information courtesy of Intuitive Surgical, Inc., and Toyna Chin.*

DAVID E. SIMMONS JR.
REGISTERED NURSE


David E. Simmons (center)

Although it wasn't a traditional career for men at the time, David E. Simmons Jr. discovered early on that he wanted to be a nurse.

"We had a career day at my high school and the director of nursing from a community college came to speak with the group," he said. "I thought it was an interesting topic to explore and requested to go hear her talk."

The decision set the course of his professional life.

He applied to Germanna Community College in Fredericksburg, Virginia, and was not only accepted, but also given a scholarship. He was one of three males in the program and the only one to graduate from the two-year program.

While still in school, Simmons worked at Mary Washington Hospital. He enjoyed the work, but was frustrated that, more often than not, he was mistaken for an attendant rather than a nurse. Often, he was taken away from his nursing duties to assist in less-skilled tasks.

"Being a male and being in the nursing profession, I was not viewed the same way as my colleagues," he said. "The staff could not separate me as a nurse from an attendant. I had my own patients, but was always being called to help and assist."

Eventually, he went to work at the University of Virginia Medical Center where he worked in the urology unit as a staff nurse and assistant head nurse. Then he transferred to the medical surgery unit where he was head nurse, and then to the acute care dialysis facility where he worked in a number of capacities within the next 21 years of his 35-year run at the facility.

During this time, he got both a bachelor's and a master's degree in nursing studies. Today, he is a clinician and clinical director of the Nephrology Clinic at the University of Virginia Health System. Nephrology deals with diagnosis and treatment of acute and chronic kidney diseases.

Now much of his time is spent working with outpatients who may arrive with a variety of issues. As a nurse, Simmons has to be flexible, using his critical thinking and assessment skills.

Although Simmons works specifically in the field of nephrology, there are a variety of jobs within the nursing field – jobs in some of the medical specialties, jobs teaching or more hands-on work in a hospital or doctor's office.

It can be a challenging career, but one that Simmons believes is incredibly fulfilling.

"Going through nursing school is no cakewalk," he said. "There are challenges at every corner. You need to be aware of this and be prepared. There will be times when you have to do a little more than others, but you should be up for the challenge." *Sandra Moran*

NURSING DUTIES

David E. Simmons Jr. has a variety of duties as a clinician and clinical director of the Nephrology Clinic at the University of Virginia Health System. On the job, you might find him ...

- Performing physical assessments (weight, heights and blood pressure measurements)
- Assessing patients for changes in their body and/or condition
- Assisting in performing kidney biopsies
- Inserting IVs, using a small catheter to inject medications into a blood vessel
- Evaluating urine specimens for blood, protein and infections
- Performing electrocardiograms to measure the electrical activity of the heart
- Educating patients about invasive procedures, and
- Trying to put them at ease and relieve their anxiety

DAWN PRUITT, R.PH.
REGISTERED PHARMACIST

Each day is like a family reunion for Dawn Pruitt, R.Ph. She's a registered pharmacist at ND Pharmacy in Dickinson, North Dakota.

A family business, ND Pharmacy was purchased by Pruitt's father, Robert Treitline, R.Ph., when she was in sixth grade. That's when she knew she wanted to be a pharmacist. Her sister, registered pharmacy technician Shelly Decker, R.Ph.Tech., also works at the pharmacy.

On a typical day, Pruitt does a lot more than fill prescriptions. "We do a lot of health screenings for cholesterol, blood pressure and blood glucose, a diabetes screening," she said. Screeners include pharmacy students from North Dakota State University (NDSU), Pruitt's alma mater.

ND Pharmacy also offers a diabetes care program. It consists of four to five 30-minute meetings with patients who need to learn how to manage the disease. Foot care, glucose meter training, traveling with diabetes and A1C testing are part of the program, said Pruitt. A Certified Diabetes Disease State Manager (DSM), Pruitt explained that A1C is a hemoglobin test. Hemoglobin is part of red blood cells. Glucose attaches to those cells. The test tells what the average blood glucose was over the last 120 days, the life of a cell.

"Becoming a DSM opened a lot of doors for me," said Pruitt. "I don't just fill prescriptions."

Three years ago, Pruitt also started a diabetes support group with the diabetes educator at a local hospital. The group now serves about 50 patients. "It's neat to see how the group has grown and developed," she said.

Dawn Pruitt (center), father Robert Treitline, R.Ph. (left) and sister Shelly Decker, R.Ph.Tech. (right)

In addition to working with patients, dealing with details is part of a pharmacist's daily work. Hundreds of insurance plans and prescriptions require double checking, and sometimes equipment breaks down.

"Insurance is the hardest, most frustrating thing we do, and it takes the most time," said Pruitt. "We have a really great technician here who does all of that for us."

"With all the medications out there, you need to really be precise. Drug companies have actually changed the name of a drug because of too many medication errors," Pruitt said.

Automation helps. ND Pharmacy uses a Windows-based program to fill prescriptions. The pharmacy also has two unique scales. One is AccuMed™, a machine that uses bar code and scanning technology to automatically fill prescriptions typed by a pharmacist. In addition to another similar scale, the pharmacy has an AccuSign™ system that records patient signatures and the time and date they picked up prescriptions. Pruitt added that staff also use PDAs (personal digital assistants) "filled with all kinds of sources of information for looking things up."

All of this helps you spend more time with patients, asking why they saw the doctor, a way of double checking the prescription and providing information about a medication, Pruitt explained. "I wouldn't be in this business if I didn't want to care for people. You need a nurturing, caring personality."

Looking back over her career, Pruitt said, "I had friends in high school who didn't know what they were going to do. They wasted a lot of funds and a lot of years going to college. Because I knew I was going into pharmacy, I took chemistry, advanced math and physics in high school, which really helped me in college. Pharmacy is a pretty intensive program. You need to be focused, study hard and keep your grades up." Pruitt advised.

Mary Pitchford

ROSEMAY MICHEL, DPM
PODIATRIST


Rosemay Michel

Rosemay Michel, DPM, didn't plan on becoming a podiatrist. In fact, she didn't even know what a podiatrist was until she began to research alternatives to medical school.

But, with her impending graduation from the University of Florida drawing near, she decided to give it a try. She figured the worst-case scenario would be that she wouldn't like it. And if that happened, she thought, after two years she would simply transfer to medical school.

So Michel applied and was accepted to the New York College of Podiatric Medicine. And before she knew it, two years came ... and went. And without realizing it, Michel had found her calling.

Over the course of her career as a podiatrist, she has treated foot-related issues ranging from diabetes to athletic injuries. Her patients span childhood to old age. And their problems can be as simple as corns, calluses and ingrown nails and as complicated as bone, muscle and joint disorders. Treatment can range from medications and corrective devices, to physical therapy or surgery.

In this regard, Michel is a textbook case. After podiatry school, she moved to the Veterans Administration hospital in Denver, Colorado, for a two-year residency. Then she returned to New York City for a fellowship in podiatric surgery with a focus on pediatrics. Finally, she accepted a second fellowship at the University of Texas Health Science Center in San Antonio where she focused on diabetic foot and limb salvage.

That fellowship led to a full-time position teaching fellows, residents and students. After eight years in Texas, she decided to make her most recent move to the Fayetteville Veterans Administration (VA) hospital in North Carolina.

"At the VA, we treat a lot of patients with old injuries that occurred during their military tours of duty, as well as patients with advanced foot problems due to diabetes and others with common foot problems," she explained. "The foot is very complicated. There are 26 bones and numerous muscles and tendons in the foot, and it plays an important role to support all the pressure of the rest of the body."

Interacting with and getting to know patients is the best part of the job for Michel – that and performing surgery, which she does once a week.

She describes an average day as beginning at 7:15 a.m. when she takes about 45 minutes to do paperwork and return phone calls and e-mails. By 8 a.m., she begins seeing patients and does that through lunch and into the afternoon. After more paperwork and handling last minute details, she wraps up her day at about 4:30. If she is "on call," she carries a pager and is the one called to handle any emergencies.

Michel is eager to expose others to the benefits of the field – especially women who constitute a small percentage of the workforce. She recommends talking to and shadowing podiatrists in their practices in their private offices or hospitals.

"I think the way to learn about any profession is to shadow someone who does it," she said. "Find someone passionate about their job. Do your homework, and help out during the summers."

Sandra Moran

GETTING STARTED

After three to four years of undergraduate education, podiatrists-to-be must complete a four-year podiatric college program and pass national and state examinations to become licensed. Other requirements include a minimum of two years of postgraduate residency training and continuing education for license renewal. Certification in a specialty also requires written and oral examinations, according to the Bureau of Labor Statistics (**http://www.bls.gov/oco/ocos075.htm**).

CRAIG COLEMAN
SPEECH-LANGUAGE PATHOLOGIST

According to the National Stuttering Association, about 1 percent of the world's population – about 3 million people in the United States – stutters.

But, if Craig Coleman has his way, stuttering will become a thing of the past.

Coleman is a speech-language pathologist and Clinical Coordinator of the Stuttering Center of Western Pennsylvania at Children's Hospital of Pittsburgh.

Although it's not clear what causes stuttering, many professionals believe it's a neurological condition that interferes with the production of speech. The most common type of stuttering usually develops during childhood between the ages of 2 and 5.

And that's where Coleman and his team come into the picture.

Developing individualized plans of care tailored to each child's needs, Coleman teaches his patients and their families how to deal with stuttering, utilize strategies to reduce the amount of stuttering and become better communicators.

A Pittsburgh native, Coleman earned bachelor's and master's degrees from the University of Pittsburgh in speech-language pathology. Speech-language pathology wasn't his original career path, however.

"I started as a pre-med major and didn't really know what area I wanted to get into," he said. "One day during my sophomore year in college, I was waiting for my advisor, who was running late. I picked up a flyer on speech pathology, and it looked very interesting. I decided to take a class in that area and the rest is history."

Coleman describes his job as overseeing the stuttering program and evaluating and treating children between the ages of 2 and 18 who stutter. As part of his job, Coleman daily works in concert with occupational therapists, physicians, developmental pediatricians, physical therapists and dietitians.

He recognizes that as a man in what is traditionally a woman's career, he stands out. But he also believes that men make great speech-language pathologists, and he recommends it as a career with endless possibilities.

"Helping the patients get better definitely inspires and motivates me," he said. "If you like working with people and helping them become more effective communicators, this is definitely the profession for you." *Sandra Moran*

Craig Coleman

"Communication is a fundamental part of who we are as individuals. It frames our relationships, education, careers and other aspects of life. Speech pathology helps people communicate more effectively. We serve individuals with speech and language disorders. We help give people a voice."

– Craig Coleman

CAREER OPPORTUNITIES

According to the Bureau of Labor Statistics **(http://www.bls.gov/oco/ocos099.htm),** speech-language pathologists, work with people who cannot produce speech sounds or cannot produce them clearly; those with speech rhythm and fluency problems, such as stuttering; those with voice disorders, such as inappropriate pitch or harsh voice; and those with problems understanding and producing language. Speech-language pathologists also work with individuals who have swallowing disorders, reading disorders, and developmental and neurological disorders, and in many other areas.

MONICA SILVA
CHIROPRACTOR

Monica Silva

If at the end of the day chiropractic physician Monica Silva has made a difference in the lives of others, then, in her mind, it has been a good day, indeed. The trick, however, is achieving that seemingly simple goal.

Because the chiropractic approach to health care is holistic, chiropractors focus on the total health of the person, rather than just illness. To correctly diagnose patients, they have to take into account lifestyle factors such as exercise, diet, heredity, the environment and the amount of rest a person gets. Like other doctors, chiropractors conduct physical, neurological and orthopedic examinations, in addition to ordering lab tests.

"I have seen cases that present as musculoskeletal pain but are surgical emergencies, metastatic cancer or chronic illness such as diabetes and rheumatoid arthritis," she explained. "The biggest challenge in some cases is that you have to make immediate decisions with very limited information. With practice, I've learned to think fast and play the different scenarios in my mind. I find the ones that are most life threatening and begin to rule those out first."

A typical day for Silva begins and ends at National University of Health Services in Aurora, Illinois, where she treats patients, performs physicals and interacts with insurance companies and other doctors. On any given day, she works with professors, radiologists, neurosurgeons, neurologists, internists, massage therapists and orthopedic surgeons to coordinate patient care.

"You have to be a people person," Silva explained. "You have to be patient and compassionate. You have to be able to think under stressful situations as well. You have to be able to listen and be very methodical in your way of thinking. You have to understand the great responsibility that you have because people are coming to you for answers. A wrong answer can mean a person's life in the case of a missed diagnosis."

According to the Bureau of Labor Statistics **(http://www.bls.gov/oco/ocos071.htm),** job prospects for chiropractors are expected to increase faster than average as demand for alternative health care grows. That's good news for Silva and others who want to become chiropractic physicians.

She offers this advice to aspiring chiropractors:

"Concentrate on the sciences," she said. "Learn all the anatomy and physiology that you can. Find a chiropractor near you who will allow you to visit him/her for an hour and maybe later for a day. Then make plans to visit one of the chiropractic schools that are located throughout the United States."

Sandra Moran

EDUCATIONAL REQUIREMENTS

The educational requirements to be a chiropractor include *at least* two years of undergraduate college courses, and most chiropractic programs require a four-year bachelor's degree. To earn a Doctor of Chiropractic, it's necessary to complete a four-year program at an accredited chiropractic college. Chiropractic programs require 4,200 hours of classroom, laboratory and clinical experience.

Once graduated, chiropractic physicians must take a test and become licensed in the state where they intend to practice. Most states also require yearly completion of continuing education classes. For practitioners who want to specialize, there is postdoctoral training available in orthopedics, neurology, sports injuries, rehabilitation, radiology, pediatrics and family practice.

JAMES H. ARNOLD, DDS, FACE
DENTIST


James H. Arnold

Jim Arnold will never forget the 29-year-old who came into his dental office in Chesterton, Indiana. For seven years, the runaway had lived on the streets. During that time he'd not once brushed his teeth. Now he was back home and determined to get his life back in order.

His smile, though, was holding him back. When the man opened his mouth, all anyone could see were rotting teeth pocked with black holes.

"He hadn't smiled for years," said Arnold, a dentist and owner of his own dental practice, James H. Arnold, DDS **(http://www.smilesbyarnold.com).** "He had been in pain for years. But he made a commitment once he came back to do something about it."

Arnold went to work, capping his patient's teeth, filling cavities and restoring the man's smile.

"Within six months he was married and had a job. Within a year and a half he had a child. Recently he stopped in the office to tell us his wife was pregnant with their second child. I don't take credit for all that, but it's amazing how important a new smile can be for a person," he said.

During his career as a dentist, Arnold has helped everyone from toddlers to senior citizens ease the pain of tooth decay, straighten their teeth or eliminate gum disease.

Most people know what a dentist is and does. But few truly understand the rewards and challenges of the job. Arnold does.

Not only does a dentist like Arnold have to know about filling cavities and applying crowns, he also has to be skilled in business. Dentists have to determine how much to spend on new equipment and training, decide how and when to advertise the business and assemble a staff of receptionists, dental assistants and hygienists.

"Dentists have to be able to manage a business and a staff. We are often unprepared for that part of the business when we get out of dental school," Arnold said.

Getting to become a dentist isn't easy, either. Students interested in dentistry take basic science courses in college. Some colleges offer a pre-dentistry degree, though most students earn biology or chemistry degrees. Students then must attend four years of dental school, where they study anatomy, physiology, biochemistry and oral biology.

Once they graduate, dentists see patients for three major reasons: to treat periodontal disease – disease that impacts the gums – to ease pain associated with tooth decay and to help craft more appealing smiles for patients whose teeth are crooked or fit together too tightly.

One of Arnold's biggest challenges is making patients feel comfortable while undergoing oral surgery or having fillings. Arnold's staff helps by baking fresh bread in the reception room to take away the traditional "dental smell." Patients can watch DVDs while Arnold works. He also offers them headphones if they'd prefer to listen to music. For the tremendously fearful, Arnold offers something called conscious sedation, a pill that allows patients to sleep through most any treatment.

For Arnold, the many rewards of his profession far outweigh the challenges.

"When a patient jumps out of the chair and gives me a hug, and then comes back a year later to tell me about how much his life has changed because of his renewed confidence, that really excites me. You can be an artist." *Dan Rafter*

A DENTIST'S LIFE

Restoring smiles leads to busy days for dentists. Arnold, for example, typically arrives in his office early in the morning to review the charts of the patients he is scheduled to see. He spends about 30 minutes preparing for these patients, then holds a 15-minute meeting with his staff. He then sees patients until about 12:30 p.m., when he takes an hour break for lunch. He sees patients again from 1:30 to 5:30 p.m. Arnold spends the end of his day returning phone calls and writing reports.

Arnold doesn't handle the work alone. He has an office manager; a scheduling coordinator; dental hygienists, the assistants who clean patients' teeth; and dental assistants, who help Arnold perform his medical procedures.

Reflections

There's one compelling reason to choose a career. You get to do something you like nearly every day of your work life.

So how will you know if you'd like a career in therapeutic services? Check and see:

- ○ I'm good at listening to people, talking to them, asking questions and responding to their needs.
- ○ I like caring for children or anyone who's sick. I'd feel really great if I could help make them better.
- ○ An exciting, on-the-go work environment would be fun for me.
- ○ I'm a high-energy, study-hard, work-hard kind of person.
- ○ I get good grades in math and science.
- ○ I'd look forward to taking algebra, geometry, biology, chemistry, psychology, statistics and other math and science classes.
- ○ I want a secure job that pays well.
- ○ I like to learn, and I'm willing to take classes to keep up to date. (Continuing education is a "must" for health professionals.)

Did you check most of these statements? Then a hands-on health career, treating people who are ill, may be in your future.

"WORDS" ANSWERS
See page 11.

1. C **2.** F **3.** D **4.** A **5.** E **6.** B

Career Data

Occupation	Education	Salaries
Anesthesiologist	MD/DO	$ 192,780
Audiologist	M, clinical exp.	63,660
Athletic trainer	B	40,720
Certified nursing associate	FT, exp.	25,894 [1]
Chiropractor	DC	81,390
Dental assistant	OJT, FT, A	31.21/hr.
Dental hygienist	A, lic.	26.59/hr.
Dental lab technician	OJT, FT	15.69/hr.
Dentist	DDS/DMD	147,010
Dietitian, nutritionist	B	50,030
Dosimetrist	B	86,076 [1]
Emergency medical technician/paramedic	FT	30,870
Home health aide	CT + test	10.03/hr.
Medical assistant	FT, A	28,270
Music therapist	B	43,869 [2]
Nurse		
- licensed practical	FT, lic.	36,550
- RN (registered nurse)	A, B, dip., lic.	62,480
Occupational therapist	B	65,540
Occupational therapist assistant	A, FT	45,180
Optometrist	Doctor of optometry*	101,840
Orthotist, prosthetist	B	64,280
Pharmacist	Pharm.D.	98,960
Pharmacy technician	OJT, FT pref.	13.25/hr.
Physical therapist	M, DPT, lic.	71,520
Physical therapist assistant	A	44,340
Physician (family practice)	MD/DO	156,010
Physician assistant	B, M	77,800
Psychologist	Ph.D./Psy.D.	59,440
Radiation therapist	Cert, A, B	71,990
Recreational therapist	B	38,330
Respiratory therapist	A, B	50,930
Social worker (medical)	M	43,040
Speech-language pathologist	M, clinical exp.	63,740
Surgical technologist	FT, A	38,800
Veterinarian	DVM, lic.	84,090
Veterinary technologist, technician	A	28,920

SOURCES

2008-09 Occupational Outlook Handbook *at* ***http://www.bls.gov/oco*** *and other sources including* [1]***http://www.salary.com*** *and* [2]***http://flahec.org/hlthcareers/music.htm***

ABBREVIATIONS

A = 2 - year associate degree; AP = apprenticeship; B = 4 - year bachelor's degree; dip. = hospital diploma program in nursing, 2 - 3 years, few remaining programs like this; CT = classroom training; DC = A or B + 4 years chiropractic college; DDS/DMD = B + 4 years dental school; DVM = B + 4 years veterinary school + 1 - 3 years internship and residency; exp. = experience; FT = formal training program, usually short-term, offering a credential such as a certificate; hr. = hour; M = B + 2 - year master's degree; MD/DO (medical doctor/doctor of osteopathic medicine) = B + 4 years medical school + 3 - 8 years internship and residency; OJT = on-the-job training; Pharm.D. = 2 years college + pharmacy school; Ph.D./Psy.D. = B + 5 - 7 years additional study; pref. = preferred

**Doctor of optometry = B + 4 years optometry school.*

Detecting Disease

You hear it in the doctor's office. You hear it in the emergency room. If you're hurting or feel ill, it's the first question medical professionals ask – Where does it hurt?

Your answer likely will put several diagnostic fact finders to work – radiologic technologists, clinical laboratory technicians, sonographers, pathologists and more.

They use knowledge, skill and mastery of high-tech equipment to detect what's going on inside of patients. And their findings are the basis for therapies that heal broken bones, take care of bacterial infections or ruptured appendixes and many other health problems.

Interested in real-world research like this? You can get a head start on several diagnostic services careers with a two-year associate degree. However, some careers in the field require a bachelor's or a medical degree. And most require continuing education to renew a license or certificate. You'll need good communication skills. Conversing with patients and health team members, discerning symptoms, taking notes and devising plans of care are part the job.

Still interested? On the following pages, you'll find out more about professional disease detectives. In the process, you may even discover that a career in diagnostic fact finding is for you.

DIAGNOSTIC RESEARCH

Clinical pathology: **http://www.ascp.org**
Forensic science: **http://aafs.org;** click on "Resources"
Medical technology: **http://www.americanmedtech.org/default.aspx**
Radiologic technology: **http://www.asrt.org**
Nuclear medicine: **http://www.snm.org**
Diagnostic medical sonography: **http://www.sdms.org/public/career.asp**
Electrocardiographic technology: **http://www.flahec.org/hlthcareers/elcardte.htm**
Electroneurodiagnostic technology: **http://www.aset.org**
Dietetics: **http://www.eatright.org**

EILEEN MALONEY, R.T.(R)(M), FARST
RADIOLOGIC TECHNOLOGIST


Eileen Maloney

Eileen Maloney really knows her field. From working as a radiologic technologist to teaching others, she understands first-hand the importance of the diagnostic end of health care.

"This is an exciting career area," she says. "It's a great blend of technology and people contact."

Maloney teaches at Passaic County Community College in Paterson, New Jersey, where she heads up her department. She also has served as president of the American Society of Radiologic Technologists (ASRT). She's a registered radiologic technologist and has been named a fellow of her organization – a top honor.

As a professor, she helps students prepare to become radiologic technologists, also called radiographers. Once primarily known as X-ray technologists, these workers perform diagnostic imaging and deliver certain types of treatments.

"When I started, it was mostly just X-ray," Maloney says. "Now things have expanded into nuclear medicine and a variety of other technologies."

To become radiologic technologists, students complete a two-year program offered by a hospital, community college or other school. After completing such a program, Maloney went on later to earn a bachelor's degree in health science and a master's in education. Those degrees qualified her for teaching and administrative work.

She says she enjoys the challenges of her career. "Working as a radiologic technologist is something like being a photographer," she says. "In a way, it's a combination of science and art. It takes talent."

She also says that the role is more difficult than some might imagine.

"Many people see us as button pushers, but it's more of a challenge than that," she notes. "Equipment is constantly changing, and even experienced radiographers are always learning new things."

Maloney has found that dealing with patients offers its own special rewards.

"When working in the field, I enjoy the patient contact," she says. "I especially like helping patients who are not able to cooperate because of a physical problem.

She also finds rewards as a teacher. "The most fulfilling part is seeing students blossom into radiographers," she says. "It's great to hear them say later that they love their jobs."

Working in the field requires stamina, according to Maloney.

"It's very physical," she says. "You're constantly on your feet, pushing and pulling patients. It can be taxing."

Maloney advises students who may be interested in a career in this area to study science.

"In high school, take courses in biology, physics and chemistry. The imaging of the future will be molecular imaging, and you'll need a solid science background for this technology. You also will need to be comfortable working with computers."

She also suggests volunteering in a health care setting.

"See if you're comfortable in that type of environment," she advises. "Some students find it's just not for them."

She also notes that radiographers need good people skills.

"Anyone who wants to pursue this career should enjoy working with people," Maloney says. "There is a lot of patient contact." *Mark Rowh*

Career Pathway Tips:

1. Begin here.

Take heavy-duty math and science classes in high school. Make good grades. Enroll in a health occupations program. Join HOSA. (Read more on page 60). Find ways to volunteer.

2. Choose one.

Some diagnostic services careers require a bachelor's degree and more, such as dietitian and pathologist. Many others don't. Check out jobs for clinical laboratory technician, diagnostic medical sonographer, dietetics technician, electrocardiographic technician, nuclear medicine technologist, radiologic technologist and others. You'll find related websites on page 21.

3. Get educated.

You don't have to invest lots of time or money to get many entry-level jobs in diagnostic services. Look for two-year community college associate degree programs or hospital-based formal training programs.

DOROTHY GAITER, R.EEG T., R.EDT
ELECTRONEURODIAGNOSTIC TECHNOLOGIST

Dorothy Gaiter is an electroneurodiagnostic technologist. That may look like the answer to a question from *Jeopardy,* but it simply means that she uses special equipment to record and study the electrical activity of the brain and nervous system.

Like most people, Gaiter did not initially include this field in her career options. A college advisor showed her a list of health care areas, and it caught her attention.

"When I saw this, I didn't know what it was," she recalls. "So I asked, and it sounded interesting."

To get started, Gaiter first attended a two-year college and earned an associate degree. Then she went to a university and completed more courses toward a bachelor's degree needed to work in this diagnostic area. Then she passed two certification exams in electroencephalography and nerve conduction. Today she's employed at a hospital in Birmingham, Alabama.

Looking back, she is pleased with her career choice.

"I love what I do," she says. "When people have neurological problems, it's important to identify what may be causing them. I like to challenge myself to see if I can help doctors diagnose problems. In this process, you use your own brain power all the time."

She says a plus is the chance to interact with patients.

"I love meeting people," she says. "You learn something every day from patients."

Working with patients also offers challenges. "If a patient is anxious or in a hurry, that's where people skills come in," she says. "Patients spend a lot of time with you, and some procedures are uncomfortable. You must get them to relax."

In a typical day, Gaiter works with eight or ten patients, with some procedures taking a couple of hours to complete. She also has administrative duties, serving as a department head. To prepare for that role, she earned a bachelor's degree in allied health with a minor in administration.

Gaiter notes that along with the right technical skills, several traits are needed to succeed in a field such as electroneurodiagnostic technology.

"You need patience," she says. "A sense of humor also helps. You also must read and spell well, and be comfortable using computers."

She says that before making health care a career choice, students should get some first-hand experience if possible.

"Consider joining a related club in school, or take a tour of a health care facility, or volunteer at a hospital. While there, take some time to talk one-on-one with people in the field."

Mark Rowh

"When people have neurological problems, it's important to identify what may be causing them."

- Dorothy Gaiter

Dorothy Gaiter

4. Earn.

The median salary for a radiologic technologist was $48,170 a year in 2006. For an automotive technician, it was $33,779; a food service manager, $43,020; a secretary, $27,450; a semiconductor processing technician, $32,860. Find more salary information on page 32 and at ***http://www.bls.gov/oco.***

5. Learn more.

Often health employers will pay for more education – your bachelor's degree or higher. More education equals a promotion and more money. In 2006, the median earnings of medical and health service managers were $73,040.

6. Have fun.

Your services are needed across the country. Your skills can take you anywhere. If you want to stay close to home, flexible hours give you more time to play than an eight-to-five, Monday-through-Friday job.

CLOVIS LOVELACE
NUCLEAR MEDICINE TECHNOLOGIST

Clovis Lovelace of West Chester, Ohio, is a nuclear medicine technologist. He works in a hospital where he helps medical doctors determine if there is any type of abnormality in patients.

"I try to help patients figure out what, if anything, is exactly wrong with them," he said. "And if there is some type of injury or sickness, I help identify the cause and extent of their discomfort."

For Lovelace, a typical day begins upon arrival at the hospital at 6:30 a.m. He prepares equipment for use, checks paperwork and begins scanning patients.

"We image hearts, lungs, kidneys, bones and thyroids," he said. "Anything that is in the body, we can image it." After images have been taken, he processes the information electronically and prints films for a radiologist to read and use in making diagnoses.

In carrying out his duties, Lovelace uses several types of advanced equipment. This includes special cameras, computers and other electronic devices. Lovelace said that along with the technical aspects of the job, he likes the challenges of working with patients.

"I enjoy having that one-on-one contact," he said. "I also like knowing that I am helping people determine the cause of their problems."

To prepare for his career, Lovelace earned a two-year degree in nuclear medicine technology from Lexington Community College in Kentucky. He advises students who might be interested in this field to take plenty of science and math courses.

Clovis Lovelace

"Take as much math, chemistry and physics as you can handle," he said. "Those subjects will help you move ahead of the pack. So don't be afraid to take the difficult subjects now, because taking them will truly pay off in the long run."

He said that good "people skills" are also important.

"You must have compassion for others," he said. "You have to put yourself in their shoes. Patients may be scared or worried, and you are the one person they are counting on to inform them about their procedure and to perform it correctly."

Lovelace believes that this field holds a promising future.

"Health care is expanding, and with an aging population, a career in the health care field would be a great choice to make," he said. "If you enjoy helping others, and you have compassion for others, you will be an outstanding health care provider." *Mark Rowh*

NUCLEAR ADVICE

"Radiology careers are long-standing, and technologists will be needed far into the 21st century. There will be a need for technologists around the nation and the world."
– Margaret Radlowski, coordinator, radiologic technology program, South Suburban College (Illinois)

"A nuclear medicine technologist can work as a manager or in a hospital, doctor's office, outpatient clinic, research, sales, marketing or education. You can work within a NM department with 1-8 people or alone in a doctor's office or outpatient clinic."
– Lorenzo Harrison, director, nuclear medicine technology program, Broward Community College (Florida)

"Before starting a career in nuclear medicine, get as much information as possible about it and find out if this is really what you want to do. Many hospitals will let you be a junior volunteer or observe in the department so you can find out if this really interests you or not. Doing this will also look great on your résumé should you decide to apply to go to school for nuclear medicine technology." *– Heather Poulin, program director, School of Nuclear Medicine Technology, Central Maine Medical Center*

DANA BROWN
HISTOTECHNOLOGIST

Dana Brown enjoys her job as a histotechnologist, a key role in a medical laboratory. She works in a hospital lab in Albany, New York, where she prepares tissue samples from patients for pathologists to study.

"I embed small blocks of tissue into paraffin blocks," she says. "I take those blocks and, using a microtome, cut them into very small slices. I place each slice onto a microscope slide and stain them using various staining procedures."


Dana Brown

Brown also performs frozen sections of tissues from patients while they are still in surgery. She then has the slide completed in a few minutes so the pathologist can determine if the doctor took out enough of the tissue. Another responsibility is to assist in autopsies.

In carrying out her duties, she works with various health care professionals including fellow histotechnologists, pathologists and other doctors.

The job involves operating several types of special equipment. The most important devices include tissue processors, embedding machines, icrotomes, stainers and cryostats for frozen sections. She also uses a computer for tasks such as recording data about patients.

"I love working in a laboratory," Brown says. "I feel proud to know the work I do is for a good purpose. Without histotechs, the diagnosis of certain illness and disease would be much harder."

She says the main challenge is working under time constraints.

"It is sometimes hard to deal with the pressure to put out quality work in a short period of time," she says. "The best thing to do is take one block at a time and not to get overwhelmed."

Brown prepared for her career by completing a two-year program at the State University of New York at Cobleskill. Along with the courses in her field, she completed courses in science and general studies. She was attracted not only by the content of the subjects she studied and the chance to work in a health care field, but also by the fact that histotechnologists are in high demand.

"A love for the sciences is needed in this field," she says. "If you enjoy being a team player and have good technical skills, this would be a good job for you. If you are interested in the sciences and like working in a hospital or research setting, give this field a chance." *Mark Rowh*

MORE ON HISTOTECHNOLOGY

"Histotechnology is expanding with new knowledge and techniques. It is an exciting area to pursue."
– Sandra King, histotechnology program director, Pima Community College (Arizona)

"The medical lab field is currently experiencing a shortage of replacement workers as the older techs retire. Those wanting a challenge will find it in this field. Hospital labs are open 24/7, so grads have a choice of various shifts to fit their personal needs."
– Kozy Corsaut, program director, medical laboratory technology program, Stark State College (Ohio)

"Investigate histotechnology as a career option. It is one career that can lead you in many, many directions – from laboratory research in the biological sciences to other medical careers – physician, nurse, medical technology, pathology, forensics ... on and on."
– Susan Michael, histotechnologist, Schoharie, New York

KEVIN SHIVELY, MT(ASCP)
MEDICAL TECHNOLOGIST

When Kevin Shively first started college, he was unsure of his plans for the future. He thought of becoming a doctor, but was not sure he wanted to go to school that long. Then he discovered the advantages of medical technology.

"It's a four-year program, and it offers a lot of variety," says Shively, who has medical technologist certification from the American Society for Clinical Pathology (ASCP). "You don't have to stay on just one track. In fact, there is a ton of options in this career."

Shively says that this field requires patience and good organizational skills.

"The work is meticulous," he says. "You need to follow procedures step by step. The key thing is being organized."

One misconception, according to Shively, is that laboratory work is highly dangerous because of exposure to disease.

"In working with biohazards, we have lots of precautions," he says. "It's very safe."


Kevin Shively

"You don't have to stay on one track. In fact, there is a ton of options in this field."
- Kevin Shively

He found that along with working in hospital-based labs, doctors' offices and other settings, some people use this career as a pathway to other careers. They may sell medical products, teach or specialize in related areas. Some even go on to medical school.

When Shively finished his program, he began working as a medical technologist. His first job was drawing blood from patients, and then he worked in a lab. Eventually he earned a master's degree in hospital administration, and now serves as associate director of Clinical Laboratories at The Ohio State University Medical Center, in Columbus, Ohio. In this role, he oversees a critical care laboratory and blood bank, among other duties.

Part of his job involves seeing that lab results are provided quickly if they are needed by doctors in emergency rooms or other critical situations.

"Many results are needed in an hour or less," he says. "You need to work fast. It's mentally challenging, and the days go quick."

Another challenge is working with different types \of people. He reports to both a pathologist and an administrative director, and he works with medical technologists of varying ages and backgrounds.

"You can gain a great deal of knowledge from these different individuals," he says.

He says that students should not be intimated by laboratories.

"If possible, get involved by volunteering or touring labs, or just talking to people who work there," he advises. "Once you get exposed to the way labs operate, you will become comfortable. *Mark Rowh*

LAB TESTS

Find out more about lab tests. Go to **http://labtestsonline.org/understanding/**.

DARIEL SMITH
PHLEBOTOMIST

Dariel Smith keeps smiling, but she winces inwardly when she approaches a patient with her needles, syringes and empty tubes to hold blood samples, and the patient says, "Oh, here comes the vampire."

"I became a phlebotomist," Smith says, "because I want to help people, and I know what I do makes a difference."

In September 2005, she entered the nine-week training program at Wheaton Franciscan Healthcare – All Saints Health Center, a 553-bed hospital in Racine, Wisconsin. She completed the 360-hour course in November and was hired to begin work there the following month.

As one of about 15 phlebotomists in her department, she draws blood from an average of 50 patients a day. "I work all over the hospital," Smith says, "in the emergency room, same-day surgery, labor/delivery and often in patients' rooms."

The biggest challenge of her job, she says, is that "nobody is happy to see me." To overcome this, she works hard to maintain a positive, upbeat attitude. "Sometimes it's hard, because many of the patients are really sick. I've had to learn not to get personally involved or to wear my emotions on my sleeve. If there are problems with a particular patient, I have to remember to greet the next ones with a smile and try to brighten their day."


Dariel Smith

Smith begins work at 6 a.m. and finishes her shift at 2:30 p.m., with a half-hour off for lunch. She uses a computer to log in the blood samples she draws, which are sent to the hospital lab for analysis. "Blood work is very important," she says, "because the doctors can use the results to find out so much about a patient.

Smith's advice to young people interested in this field? "You have to have patience and a friendly attitude that wins people over. This job pays quite well, and it's good to know I'm able to perform an essential service that helps people without the time and expense required for a college degree. There's job security, too. I don't think robots are going to be drawing blood any time soon!" *Patty Williamson, Ph.D.*

WORD DIAGNOSIS

There's a Scrambled Word Disease epidemic. Use the clues to help you diagnose problems and propose solutions, which you'll find on page 32.

1. **TMGORPOHAY.** A way to produce images of the body's interior using X-rays or ultrasound.

T	O			G	R				Y

2. **MNATGEIC RENCSONAE.** An imaging technique that uses magnets and radio waves to see the inside of the body.

		G	N		T		C
	E	S		N			C	

3. **RDAOATIIN.** High-energy light waves used to produce interior images of the body.

R		D	I					N

4. **UTASNLOURD.** High-frequency sound waves that produce images of the interior of the body.

		T	R					N	D

5. **BPISOY.** To remove a tissue sample from the body to examine under a microscope.

B			P	S	

Pathologists' assistants meet emerging demands

Everybody knows about doctors and nurses, but some health care jobs are much less well known. Such is the case for pathologists' assistants, who perform important behind-the-scenes work.

This career area has only been around for a few decades, so it's understandable that some people have never even heard of it. But the pathologists' assistant's role represents an emerging component of the expanding health care community.

"Pathologists' assistants work as physician extenders in a similar way that physician assistants do for clinicians," said John E. Vitale, acting chair and assistant professor in the Pathologists' Assistant department at Rosalind Franklin University of Medicine and Science in North Chicago, Illinois. He explained that they assist pathologists in roles such as dissecting surgical specimens and performing autopsies. This includes tasks such as helping prepare clinical histories, obtaining biological specimens, maintaining equipment and assisting pathologists in other ways.

Because they work under the supervision of pathologists, these specialists do not need to complete the long years of training required of physicians. Most qualify for their jobs after earning a bachelor's or master's degree.

According to the American Association of Pathologists' Assistants, many PAs have previously worked as histotechnologists, medical technologists, autopsy technicians or other health care workers. They pursue careers in a variety of settings ranging from large academic medical centers to small community hospitals.

"Pathologists' assistants are currently in great demand, and the demand is only expected to grow in the future," Vitale says. He also points out that they earn excellent salaries. The American Association of Pathologists' Assistants (AAPA) reported starting salaries of $60,000 - $90,000 a year in 2008.

Pathologists' Assistant Program students Brandi Woodard (left) and Trina Sherlitz (right) work with their professor (center) at Rosalind Franklin University of Medicine and Science, North Chicago, Illinois. Professor John E. Vitale, MHS, PA(ASCP), is the program director. He also is acting chair of the Pathologists' Assistant Department and an assistant professor.

Like any health care career, this field can be challenging. Working as a PA requires not just the right training, but also certain traits. Patience, thoroughness and the ability to follow directions are important. A liking of science and an ability to work in a clinical setting are also needed. Those who are unable to become accustomed to assisting in autopsies or other work with human tissues would not be a good match for this career.

"Being a member of the health care team can be highly rewarding," Vitale says. "It's also good knowing that the work you do helps save lives."

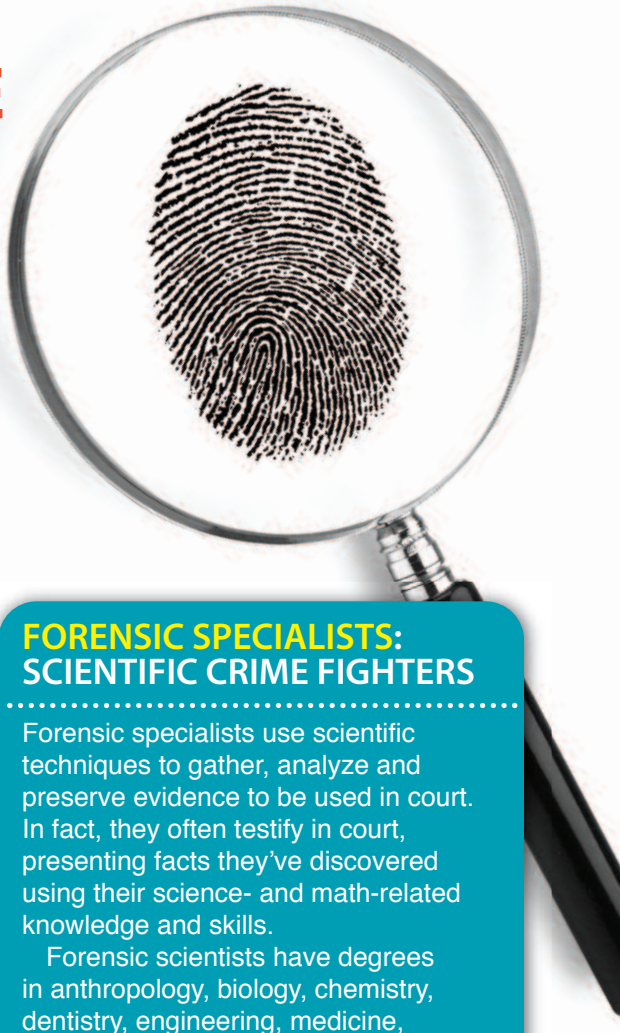
To learn more, Vitale recommends checking out the AAPA website at **http://www.pathassist.org.** He also suggests taking courses in science to help develop your interests and the necessary knowledge. *Mark Rowh*

DUTIES OF PATHOLOGISTS' ASSISTANTS

While working under the supervision of a pathologist, pathologists' assistants perform duties like these, according to the American Association of Pathologists' Assistants:

- Help prepare human postmortem examinations
- Describe gross anatomic features, dissect surgical specimens and prepare tissues for histologic processing
- Obtain biological specimens such as blood, tissue and toxicological material for studies
- Photograph pertinent specimens and microscopic slides
- Obtain clinical history, including scans, X-rays and laboratory data
- Perform duties related to the administrative maintenance of surgical pathology protocols, reports and data
- Maintain equipment and supplies

Forensic Technicians MAKE THE CRIME SCENE



Do you enjoy watching TV shows where highly trained people use special skills to analyze physical evidence in *solving crimes*? Of course that's just television. But the real-world need for qualified forensics technicians can lead to a solid career choice.

"With the advent of DNA analysis and the numerous crime programs on TV, forensic science as a degree program has experienced unprecedented growth and interest," says Dr. Ann Geisendorfer, department chairperson of criminal justice and forensic science studies at Hudson Valley Community College in New York.

"It is the perfect job for someone who is interested in science and the criminal justice system," she said.

According to Dr. Thomas A. Crist, a forensic anthropologist who teaches at Utica College, job opportunities for employment in this area can be found at the local, state and federal levels. At the same time, the work itself holds real importance.

"At the end of the day, you have the satisfaction of knowing that your work has helped convict a criminal or set an innocent person free," he said. "Or it has helped families reach closure regarding the disappearance or death of their loved ones."

Forensics technicians work with a wide range of people including detectives and other police officers, members of the legal profession and forensic scientists. Some obtain jobs after completing some college or earning a two-year degree, while others earn bachelor's degrees. Typically, they complete courses in several fields including science and math, and in some cases criminal justice.

"The best forensic technicians are those who have good analytical thinking skills," Crist says. "They also are naturally curious and like to solve problems."

Along with strong analytical skills, good character is also important.

"Integrity is critical to forensic scientists as they must appear on the witness stand to offer expert testimony, and their credibility on the stand is a reflection of high or low integrity," says Charles Coughlin, a laboratory lecturer at the University of North Florida. "To obtain the positions in the first place one must not have a criminal record or even a history of financial difficulty."

To check out this career path, Crist advises talking with people who work in the field.

"Ask your local police department for opportunities to shadow people already in the field," he says. "Try to find formal internships if you can, but informal observation is also useful. Read popular books from the library written by forensic scientists and criminalists to see if you would enjoy their type of work. Call or write to them and ask how they began their careers. Also, sign up for math and science classes and do well in them." *Mark Rowh*

FORENSIC SPECIALISTS: SCIENTIFIC CRIME FIGHTERS

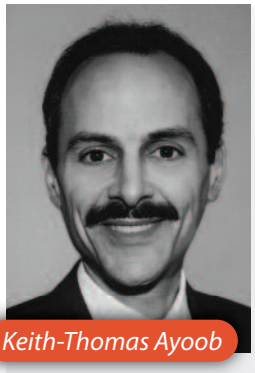
Forensic specialists use scientific techniques to gather, analyze and preserve evidence to be used in court. In fact, they often testify in court, presenting facts they've discovered using their science- and math-related knowledge and skills.

Forensic scientists have degrees in anthropology, biology, chemistry, dentistry, engineering, medicine, microbiology, psychology, physics and other related degrees, plus classes and continuing education in forensics.

They find jobs as forensic nurses, odontologists, pathologists and psychiatrists; crime scene investigators, medical examiners or coroners; forensic technicians, criminalists, toxicologists and wildlife specialists; forensic engineers, accountants, computer specialists, and aviation and construction accident investigators; and forensic photographers, skull reconstructionists, and document and polygraph examiners. There are even more job titles for people who work in forensics.

Many work for the government at every level. Others work in private laboratories or as consultants, serving law enforcement agencies, law firms and other private clients.

KEITH-THOMAS AYOOB, ED.D., RD, FADA
PEDIATRIC NUTRITIONIST


Keith-Thomas Ayoob

Once upon a time, Keith-Thomas Ayoob wanted to be a veterinarian. Today he works at the Albert Einstein College of Medicine in New York City. He's the director of nutrition at the Rose F. Kennedy Children's Evaluation and Rehabilitation Center and an associate clinical professor of pediatrics.

It may seem like Ayoob took the long way around when it came to finding his career path. Actually it turned out to be a short step.

As an undergraduate working on his bachelor's degree, Ayoob chose a major that would qualify him for veterinary school, medical school or another such program.

"I had always been interested in food and how it affects the body," he says. Rather than majoring in chemistry or biology, he majored in nutrition science at the University of California, Davis, where science classes would relate to something that interested him.

Science classes often are about chemicals and reactions, which are hard to understand, according to Ayoob. "When I could relate science to something like nutrition, it was much more real. It made more sense to me. Nutrition seemed much more interesting."

Ayoob's interest in nutrition has made work interesting for him, too.

Today he primarily works with children and parents or other caregivers who have been referred to him. Most of the children are overweight or underweight, or have eating behavior problems or genetic syndromes where nutrition is impaired.

Sometimes he sees children with Down syndrome. They frequently don't grow as well, according to Ayoob. They're prone to being overweight and diabetic. Therefore, he counsels parents to give the child enough activity and monitor food intake so the child doesn't become overweight.

Other times he sees toddlers with eating behavior problems. For example, a three-year-old may only be eating baby food. Sometimes that's all the child can handle. Often, however, it's because the child needs to learn how to eat.

"That's where parents come in. Parents need to teach a child how to eat," Ayoob says. In cases like this, he advises parents to challenge toddlers with new foods. "The child may not like it the first time, but parents need to persist and be patient."

Ayoob sees older children, too, who sometimes become obstinate and won't eat correctly. "Kids are buying a lot of junk food," he says, "but where are they getting the money?" Ayoob does a lot of parent education.

"Food needs to take its appropriate place in life," counsels Ayoob.

In addition to nutrition consulting, Ayoob does clinical teaching of new doctors and students working on master's degrees. He's a researcher studying obesity in inner-city children and growth parameters of children with HIV. He's also a Fellow of the American Dietetic Association, where he volunteers as a speaker, writer and editorial consultant.

When it comes to career advice, Ayoob says, "It's important to choose a major you really do like. Change it if you want. When you do what you love to do, you'll never feel like you're working."

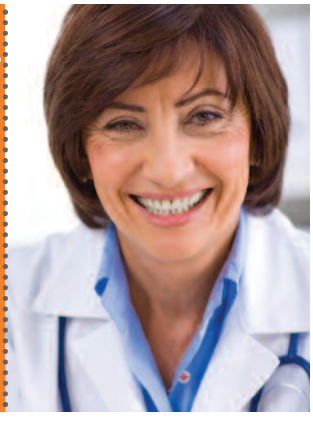
Mary Pitchford

Clinical teaching? What's that?

Health professionals often learn on the job. Sometimes these clinical teaching situations happen in just a few minutes at a patient's bedside.

Using special teaching skills, knowledgeable, experienced clinical teachers help students learn. These skills include:

- Working with students as they diagnose a patient's problem.
- Pointing out general rules and guidelines.
- Asking students questions to find out what more they need to learn, such as "How did you arrive at this diagnosis?" and "What other information might you need?"
- Providing positive feedback when students do something right, which helps them remember to do it right the next time.
- Correcting errors, so students will do something differently the next time.



Good News about NUTRITION

No doubt Keith-Thomas Ayoob knows a lot about nutrition and health. With a bachelor's degree, two master's degrees and a doctoral degree, he's studied it for a long time.

Now Ayoob works with nutrition every day. He talks to patients about it. He teaches it. He also talks to the public and the media about it.

Here's some news about good nutrition that Ayoob wants you to know:

Make a calcium deposit.

Osteoporosis starts when you're young unless you get more calcium – big time. By age 20-25, bones don't absorb calcium anymore.

Do you have a calcium problem? Diagnose yourself. If you're drinking a lot of soda, you're not getting enough calcium.

Build up your bone bank as early as possible. Eat as many lowfat dairy foods as you can every day. Even chocolate milk is okay.

Bag your own snacks.

Choose the fruits and veggies that you like best, and eat them every day, as often as possible. You'll stay healthy that way.

Breakfast works.

Students who eat breakfast do better in school. Have a glass of milk, a piece of fruit and half a bagel.

You can fix meals like this on your own. It's part of growing up and being independent. Your parents will be thrilled. They'll be even more thrilled if you clean up after yourself.

Pills are not the answer.

No one has ever been able to put into a pill what you get in healthy food. Besides, even if it could be done, you'd still have to eat.

Be open to new foods.

People feel good when you enjoy the foods they serve. It can help you build friendships and get to know other cultures.

Don't give up on a new food the first time you try it. Try it more than once. Often you'll find you'll like it. Trying new foods expands your eating enjoyment.

Plus, the more varied your diet, the healthier you are. That's assuming you make healthy choices. Chips, snack cakes and soda are not a varied diet.

Reflections

Do you agree with any of the following statements? If so, check the box to the left of the statement. A majority of checks means you might enjoy a diagnostic services career.

- ☐ I'm sensitive and would be able to deal with patients' physical and psychological needs.
- ☐ I'm a positive person and would be able to communicate with people who are under stress.
- ☐ I have a lot of stamina. I'd be able to lift and turn patients and work on my feet for long periods of time.
- ☐ It would be fun to operate high-tech, computerized diagnostic machines.
- ☐ I'm good at problem solving. I'd enjoy a flexible schedule and wouldn't mind working a variety of daytime, evening, weekend or on-call hours.
- ☐ I'm detail-oriented and would be able to follow physicians' directions precisely.
- ☐ I'm well-organized and can keep good records.
- ☐ Health care professionals work on teams, so I'd fit in well.
- ☐ I like math, science and English classes and wouldn't mind continuing my education.

Career Data

Occupation	Education	Salaries
Cardiovascular technologist/ technician, including electrocardiograph (EKG) and vascular technician	A/OJT	$42,300
Diagnostic medical sonographer	CTE, A, B	57,160
Electroneurodiagnostic (END/EEG) technologist	A	45,111* [1]
Medical and clinical laboratory technologist, including:	B	49,700
- Cytotechnologist		26.39 - 31.64/hr.
- Histotechnologist		21.50 - 23.29/hr.
- Phlebotomist		11.25 - 12.15/hr.
Medical and clinical laboratory technician including:	A	32,840
- Histotechnician		18.27 - 20.86/hr.
Medical scientist	PhD/MD	74,160
Nuclear medicine technologist	FT, A, B	62,300
Pathologist (group practice)	MD/DO	233,833 [1]
Radiologic technologist/ technician, including computed tomography (CT) technologist, magnetic resonance (MR) technologist and mammographer	A, B	48,170
Radiologist (interventional)	MD/DO	354,686 [1]

SOURCES

2008-09 Occupational Outlook Handbook *at* ***http://www.bls.gov/oco*** *and other sources including* [1]***http://www.salary.com***.

ABBREVIATIONS

A = 2 - year associate degree; B = 4 - year bachelor's degree; FT = formal training program, usually short-term, offering a credential such as a certificate; MD/DO (medical doctor/doctor of osteopathic medicine) = B + 4 years medical school + 3 - 8 years internship and residency; OJT = on-the-job training; PhD = B + 5 - 7 years additional study.

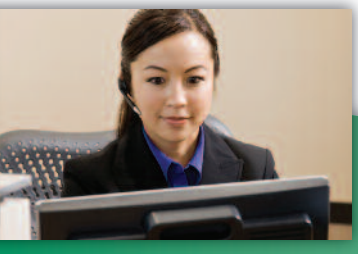
**Average salary reported.*

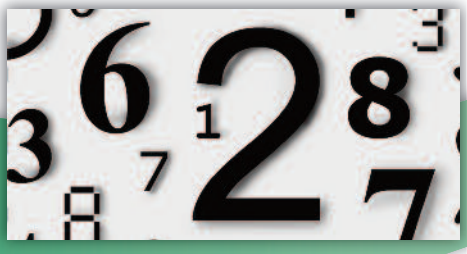
"WORD DIAGNOSIS" SOLUTION

See page 27.

1. Tomography
2. Magnetic resonance
3. Radiation
4. Ultrasound
5. Biopsy

The Health Business





Do you have a detailed, business kind of mind, plus a helpful "people" personality? Then you're very likely to enjoy a business-oriented career field that people often don't consider. It's the health informatics career pathway, and opportunities abound!

Are you a "front desk" person? You could be an admitting clerk in a medical or dental practice, outpatient surgery center, diagnostic laboratory, hospital or other agency where people go for health care help.

Are you a behind-the-scenes person? You could be a billing specialist, insurance clerk, medical coding specialist or health information manager.

Do you have a "take charge" personality? You could be a medical practice manager, directing patient traffic, hiring and scheduling personnel and medical procedures, inventorying and ordering supplies and equipment, and helping patients with business or health issues.

Do you enjoy communicating with people? With the right skills and knowledge, you could be a medical or dental assistant in a busy practice, meeting the needs of professionals and patients alike.

If you take a look at recent government data, you'll find that many of these careers offer entry-level employment to people with high school career-technical education, postsecondary certificates or associate degrees. And jobs are growing at a really fast rate.

So there's bound to be a business career for you in several health services fields!

FOR MORE INFORMATION

American Association of Medical Assistants: **http://www.aama-ntl.org**
American Health Information Management Association: **http://www.ahima.org**
Association for Healthcare Documentation: **http://www.ahdionline.org**
Career Guide to Industries (Health Care): **http://www.bls.gov/oco/cg/cgs035.htm**
Medical Library Association career site: **http://www.mlanet.org/career/index.html**
American Medical Informatics Association: **http://www.amia.org**
American Public Health Association: **http://www.apha.org**
Medical Group Management Association: **http://www.mgma.com**
National Association of Social Workers: **http://www.naswdc.org;** under "Resources," go to "Student Center"

SANDI TOMLINSON
ADMITTING CLERK


Sandi Tomlinson

Sandi Tomlinson works in an area of health care where information gathering is vital. She is an admitting clerk at Sutter Roseville Medical Center in California.

"Every person who is treated in the hospital needs to be registered through admitting," Tomlinson says. "Most hospitals have an admitting department for emergency room patients and a central admitting department for all other patients."

On the job, Tomlinson and other admitting clerks typically gather contact information, health-related information, insurance information and other information from patients or sometimes from family members. They also register the patient in the hospital through a computer system. They obtain information by talking with patients or family members, or from paperwork that has been filled out. The information stays in the patient's medical record, so it needs to be accurate.

"It is a challenge at times, because you may have several people to admit at once," Tomlinson says. "You're pulled in all different directions and have to be able to prioritize and work together well with other team members." That health care team includes doctors, nurses, technicians and sometimes staff of outside facilities such as skilled nursing centers.

To succeed, Tomlinson says, "It helps to be outgoing, flexible and a service-oriented person. In addition to being a high school graduate, most employers are looking for someone with a background in medical terminology, computer skills and good typing skills." Computer skills are particularly important, since various computer programs are used, as well as programs unique to a particular hospital, she adds.

Most admitting clerks work in hospitals, like Tomlinson, and in outpatient facilities. Tomlinson suggests that students who may be interested in her career try to do some volunteer work at a hospital.

According to Tomlinson, being an admitting clerk can be a very rewarding job. "When your patient says 'thank you,' it makes the hard work worthwhile."

Mary Ann DePietro

PUZZLING INFORMATION

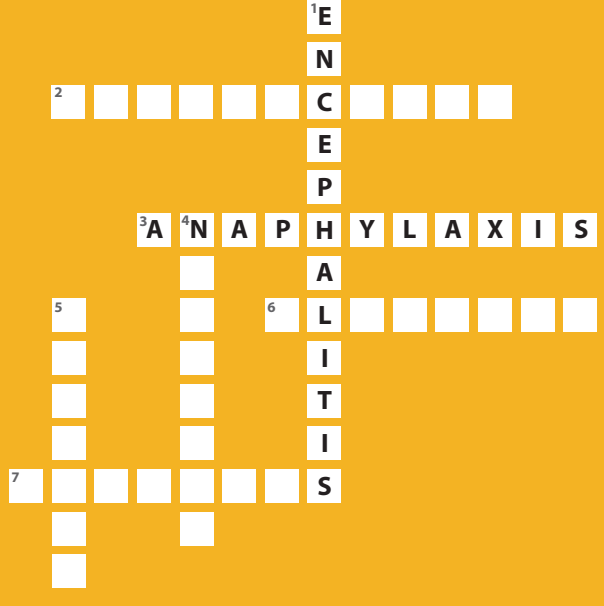
Want a job in health information? Use the clues to place these puzzling words. Solution on page 36.

Across

2. Tooth removal
3. Life-threatening allergic reaction
6. Presence of glucose, a type of sugar, in the blood
7. Ringing or other noise in the ears

Down

1. Inflammation of the brain
4. Tissue changes that indicate cell death
5. Feverish, having a fever



Puzzle made at http://www. puzzle-maker.com.

KAREN MINCHELLA, PH.D., CMA
CERTIFIED MEDICAL ASSISTANT AND EDUCATOR

Interested in a medical career with wide-ranging responsibilities? Maybe a career as a medical assistant is right for you. That's what interested Karen Minchella when she was in high school.

Minchella worked as a hospital unit secretary, but wanted to do more than administrative work. Someone suggested medical assisting to her.

Today Minchella is not only a certified medical assistant but also has earned a Ph.D. and is an instructor in a medical assisting program at Baker College in Michigan.

Minchella instructs students in administrative work and clinical duties. Minchella says, "Clinical responsibilities vary from job to job, but may include collecting specimens, obtaining vital signs, preparing a patient for a medical exam or procedure, assisting the physician, and performing diagnostic tests."

Administrative responsibilities also vary but usually include phone management, scheduling appointments, billing, and developing and maintaining a patient's medical record. "It's very important to obtain accurate information and update it to allow the health team to direct the patient's treatment plan," says Minchella.

Medical assistants are employed in a variey of medical institutions, including but not limited to doctor's offices, ambulatory care centers, clinics, research centers and emergency rooms. According to Minchella, most facilities prefer to hire certified medical assistants (CMA).

To become certified, students must attend an accredited medical assisting program, usually one to two years in length. After completing a program, including an internship at a medical facility, a graduate is eligible to take the certification exam administered by the National Board of Medical Examiners and the American Association of Medical Assistants.

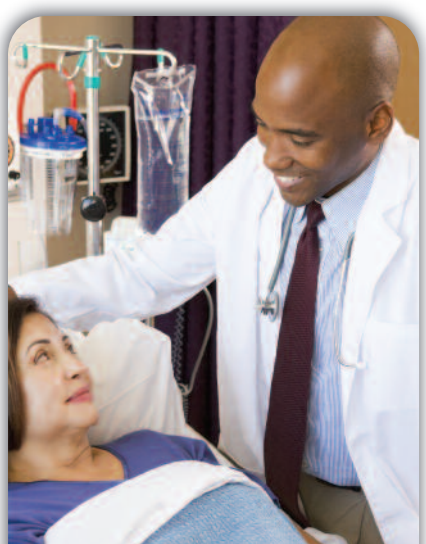
"A CMA career is a good choice for someone who likes diversity. I enjoy all the different responsibilities and opportunities to work in various settings, with room for growth in the medical profession" says Minchella.

Karen Minchella

In addition to patients, CMAs work with members of the health care team, including doctors, physician assistants and multiple other health professionals. Sometimes that can be a challenge, but clear communication helps resolve conflicts, according to Minchella.

Other challenges include handling many tasks at once and learning how to prioritize. Skills needed include being a good listener, caring, and being organized and able to "multitask."

"To prepare for a career, students should volunteer in a medical facility to see what we do and take computer, math and biology classes. There's a high demand for medical assistants, and if you like working with people, it is an excellent career choice," Minchella says. *Mary Ann DePietro*



MORE ASSISTANCE

For more information go to the American Association of Medical Assistants at **http://www.aama-ntl.org.** For a list of accredited programs, go to the Commission on Accreditation of Allied Health Education Programs at **http://www.caahep.org.**

"If you like working with people, it is an excellent career choice."

-Karen Minchella

DONNA EATON
MEDICAL OFFICE ADMINISTRATOR


Donna Eaton

Thirty years ago, Donna Eaton went to work as the medical office administrator for Dr. Jacob Klein, an obstetrician/gynecologist in St. Louis, Missouri. She's still there today, keeping things running smoothly in the office that now includes four OB/GYNs who see up to 120 scheduled patients a day, plus emergencies.

Eaton's responsibilities include:

- Hiring and firing personnel, who include a nurse practitioner, four medical assistants, three secretaries, an insurance clerk and a part-time person who does bone-density scans
- Scheduling surgeries and getting them pre-certified by the patients' insurance companies
- Paying all the office bills and preparing payroll checks
- Screening calls for the doctor for whom she serves as secretary and handling his personal business
- Filling in when the office is short-handed, doing whatever is necessary to keep the day running smoothly

Since 1986, billing, insurance filing and appointment scheduling has been done on the computer. The office is moving toward being "paperless," with all documents scanned into the computer.

Eaton's first job was in another doctor's office, where she was trained to take over the manager's position. Today, she said, many of the office personnel come directly from technical high school programs. The medical assistants have two-year associate degrees, and some have completed three-month internships. The office pays for courses to advance and update training.

"It's a more complicated world than it was 30 years ago," Eaton said. "A question for an insurance company that should take five minutes to clear up may take an hour, because it's so hard to reach an actual person on the phone. Voice mail has made everything more impersonal.

"Although we don't have a lot of turnover in our office, I'm finding it's more difficult now than it was 15 years ago to find qualified people who are willing to spend a full day pitching in and working as part of the team."

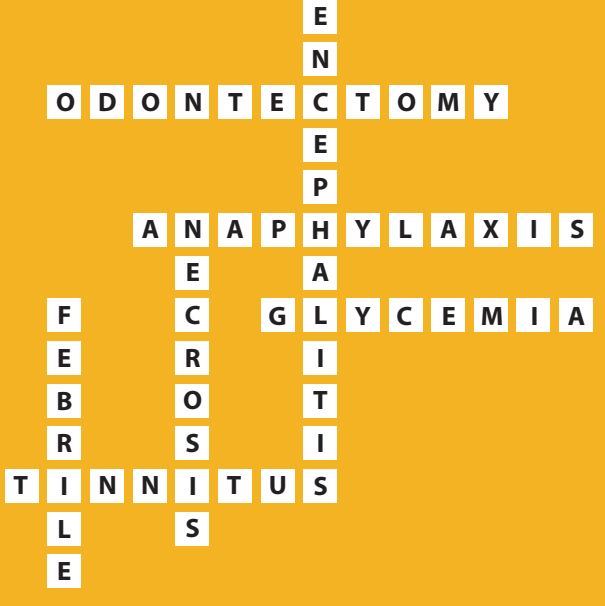
Eaton's position requires a tremendous amount of patience, a sense of humor and the ability to listen to what people are telling her without getting too involved.

"I really enjoy working with people," she said. "Because I've been here so long, I'm able to deal with patients who call in concerned about problems they've self-diagnosed. I'm usually able to calm them down. I can sort out the ones who do need to see the doctor right away, and those who just need reassuring.

"My reward is when someone says, 'Oh, you've made me feel so much better.'" *Patty Williamson, Ph.D.*

"PUZZLING" SOLUTION

See page 34.



CHARLIE LEAL
MEDICAL TRANSCRIPTIONIST AND ENTREPENEUR

Charlie Leal

Charlie Leal works in her home office in O'Fallon, Missouri, transcribing tapes a doctor has recorded after patients' office visits. She often makes a game of trying to diagnose their conditions herself before she hears the doctor's opinion. After 15 years as a medical transcriptionist, she's not often wrong.

Leal and a partner own Expert Medical Scribes and employ four other people. Like about half the medical transcriptionists in the country, all of them work at home. Others are employed by clinics and hospitals.

Leal's company provides 24-hour turnaround service. A typical work day begins with returning the previous day's tapes and a typed copy of their contents, then going back to her office to repeat the process with a new set of tapes. She usually types for 45 minutes, then rests for 15 as she transcribes tapes from six to eight doctors each day.

"What I like best about my job," she said, "is that I can work alone at home with my pets, I set my own schedule, I'm constantly learning things and the pay is excellent."

She gets tremendous satisfaction from knowing that her work is absolutely accurate, as it's the record that goes into patients' files.

If a doctor is discussing a problem with a patient's right shoulder, then later refers to the left shoulder, Leal flags this on the cover sheet she returns with the typed copy. She also points out anything else she questions, such as a prescribed medication dosage that seems unusual. Understanding medical terminology requires a lot of experience and the help of many references, such as *Dorland's Illustrated Medical Dictionary* and books of surgical, drug and laboratory terms.

It's possible to be trained on the job, as Leal was, or to take college classes or home-study courses to become a transcriptionist. To be successful, you must "have a good ear," be a careful listener and have excellent skills in grammar, spelling, punctuation and computer use.

She recommends getting so familiar with keyboard commands that the mouse is untouched. "If my hands aren't on the keys, I'm not making money," she said.

Challenges of her job are broken or damaged tapes, keeping up with information about new drugs doctors are prescribing, the time constraints of providing one-day service and doctors who eat lunch while dictating. However, Leal gets tremendous satisfaction from knowing that her work is accurate. *Patty Williamson, Ph.D.*

ENTREPRENEURSHIP

WANT TO BE THE BOSS?

Entrepreneurs don't just buy businesses. They create their own.

Architects and electricians. Writers and proofreaders. Dentists and physicians. Restaurateurs and TV chefs. Medical transcriptionists such as Charlie Leal and her partner.

What do they have in common? All are entrepreneurs – people who recognize opportunities and create businesses that produce products and services that meet other people's needs.

If you think you want to be your own boss, go to **http://www.entrepreneurship.org** and **http://www.successmagazine.com/Entrepreneurship-Quiz/PARAMS/article/581/channel/20.**

BEHIND-THE-SCENES

Workers in the Health Information World

More than an office job in a health care setting, health information is a cutting-edge information technology career that can make a difference in the quality of health care, according to Barbara Odom-Wesley, Ph.D., RHIA. Odom-Wesley owns Medpro Services in Arlington, Texas. She also is a past president of the American Health Information Management Association. (AHIMA).

Careers in health information management (HIM) offer flexibility and challenge, an opportunity to climb the health care career ladder and a chance to specialize.

Depending on where they work, HIM professionals can choose one of three shifts in an acute care facility. Those who want a typical business day and work week can choose an ambulatory facility or the pharmaceutical, insurance or other related industries.

"What you'll do on the job depends on where you are in your career and where you want to go," says Odom-Wesley. "If you're a high-tech coder at the beginning of your career, you'll work in front of a computer. As you move up, you could be an employee supervisor or trainer, or work with computer and database systems. Further up the career ladder, you could be in a management position working in a quality control role with medical staff. Or you could be the vice president of a health care facility."

The steps on the HIM career ladder to success include AHIMA certification. The chart shows what it takes to achieve it.

In high school, classes in biology, chemistry, anatomy, physiology, medical terminology, human diseases, business, management and English are important if you want to enter an HIM program, according to Odom-Wesley.

To learn more about these careers, go to **http://www.ahima.org.** Click on "Schools & Academics" and "Careers in HIM."

Mary Pitchford

Barbara Odom-Wesley

Becoming Certified

High school diploma and other requirements	Certified Coding Associate (CCA) Certified Coding Specialist (CCS) Certified Coding Specialist – Physician-based (CCS-P)
Two-year associate degree and other requirements	Registered Health Information Technician (RHIT)
Four-year bachelor's degree and other requirements	Certified in Healthcare Privacy (CHP) Certified in Healthcare Security (CHS) Certified in Healthcare Privacy and Security (CHPS) Registered Health Information Administrator (RHIA)

WILL LAFOLLETTE
QUALITY CONTROL TECHNICIAN

Quality control technicians can work in any sector of the health care field, from clinics to hospitals to pharmaceutical manufacturers.

As a quality control technician for the Marshfield Clinic – a group of 41 physician centers located across Wisconsin – Will LaFollette makes sure that the clinics are serving patients in the most effective and efficient way possible.

LaFollette, senior systems and processing engineer with the Marshfield Clinic, does this by working with the doctors, administrators and department heads at the clinics to make everything from the filing of paperwork to the scheduling of patient visits happen in the most efficient way posible.

"People in quality control want to know how to make the process more efficient, reduce the costs of health care and improve patient satisfaction," LaFollette said. "We provide our people the tools to make the process better, to make lasting, permanent changes."

Here's an example of LaFollette's work: Before doctors can perform surgeries they must receive a set of paperwork and test results for each operation. This paperwork was too often arriving late or with incomplete information at one of the Marshfield Clinic's sites. Doctors then had to cancel and reschedule their surgeries.


Will LaFollette

This was a big problem. Patients were upset, and constant rescheduling cost the clinic loads of money. It's expensive to prepare a patient for a surgery that doesn't happen, to assemble a surgical team and to sterilize equipment. To do it more than once because paperwork arrives late or with missing pieces is even more expensive.

LaFollette and his team of quality control personnel visited each of the departments that sent work to the surgical center and measured how often they did or did not get the paperwork to the center on time and complete. They found that the departments put together the paperwork in vastly different ways. LaFollette and his co-workers changed this, creating a standard procedure for putting together paperwork. Now all the departments follow this standard.

The results have been impressive. Departments now get their paperwork to the surgical center on time and in good shape 35 percent more often, which means a cost savings of tens of thousands of dollars.

Commenting on the rewards of careers in his field. LaFollette said, "You have a project, something in your hands that you can make yours. As you go through the project, you can see the positive results. One of the things I enjoy most is that I see the results of my work right away."

"Health care facilities have such a strong desire and have major influences acting on them that drive the need for change," he continued. "I think that also has been vital to the success of my career in the health care sector." *Dan Rafter*

FIND OUT MORE ABOUT QUALITY

In addition to his "day job," Will LaFollette is a member of the board of the American Society for Quality, **http://www.asq.org**.

ASQ offers techniques and training related to quality in the education, government, health care, manufacturing and service industries.

DOROTHY SCHMIDT
MEDICAL LIBRARIAN


Dorothy Schmidt

When nurses, doctors and patients have a medical question, they know they can turn to Dorothy Schmidt to help them locate the answers and information needed. Schmidt has been a medical librarian at Sutter Roseville Medical Center in Northern California for six years.

"Medical librarians are experts in locating information and connecting people to it," according to Schmidt. These high-tech information seekers work in hospitals, medical schools, clinics, research centers and government agencies. You'll also find them in the biotechnology, insurance, medical equipment, pharmaceutical and other industries.

Librarians at a medical facility will receive an inquiry for information from someone and do a subject search through books, journals and the Internet. They help locate databases to gain additional information on a topic and are in charge of selecting books and journals to purchase.

Schmidt began working as a librarian 18 years ago after receiving her master of arts degree in library science. Many medical centers prefer to hire someone with a master's degree, although those with a bachelor of science degree in biology or another science may be trained on the job to work in medical libraries. Students, for example, may work as library technicians, filing information, searching databases and cataloging information. In addition to work experience, classes in biology and computer science are important.

The skills needed to be a success at this type of work include being able to work quickly at several tasks at once and being detail oriented. "It helps to be someone who likes to find answers. It's like putting the pieces of a puzzle together," says Schmidt.

Being a problem solver also is a plus. It's challenging to understand what a person is looking for. Schmidt handles this by talking with the individual to help narrow the person's focus.

"A typical day includes health care professionals wanting information on a disease or treatment. For example, a doctor may want me to find information on the latest surgical technique or drug therapy for a disease," says Schmidt.

"Patients and family members also need information," Schmidt says. "Patients may need to learn about their diagnosis to choose the treatment they want. The knowledge they gain often helps displace fears."

According to Schmidt, connecting patients with information is very rewarding. "Without the knowledge, patients can't make wise choices. Sometimes the information they gain is the best medicine. I like helping with that." *Mary Ann DiPietro*

MAKING CONNECTIONS

Connect to more information about careers for medical librarians at **http://www.mlanet.org.** It's the Medical Libary Association website. First, click on "Career Development." Then, under "Career Resources for Medical Librarians," click on "Students."

Reflections

Therapeutic and diagnostic services offer lots of "hands-on" health care types of jobs. However, if you check most of the boxes below, the business and education side of the industry may hold high interest for you, particularly in the area of compiling and providing health information.

- ○ I'm a real "information detective." I like finding and figuring out facts and data.
- ○ I like science and history.
- ○ Although I like working with others, I also enjoy working independently.
- ○ I'm a a good coach and teacher.
- ○ I'm detailed and have great focusing skills. I'm also a great organizer.
- ○ I don't mind routine work.
- ○ I want a secure job that pays well.
- ○ I like to learn, and I'm willing to continue my education to keep up to date.

Career Data

Occupation	Education	Salaries
Epidemiologist	MPH	$ 61,680
Billing, accounting and auditing clerks	CTE, A, FT	30,560
Financial manager	M	90,970
Medical and health services manager	M	73,340
Health educator	B, cert.	41,330
Medical records and health information technician	A	28,030
Medical assistant	FT, A	26,290
Medical librarian	MLS	44,000 - 57,314,[1]*
Medical secretary	CTE, A	28,090
Medical transcriptionist	CTE or A	14.40/hr.
Office clerk, general (general medical and surgical hospital)	CTE, OJT, computer skills	26,050
Receptionist and information clerk	CTE, OJT	11.01/hr.
Social and human services assistant	A, FT	25,580
Social worker (medical/ public health)	MSW	43,040

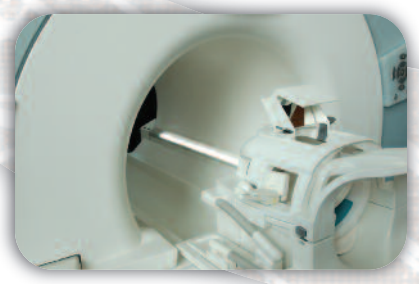
SOURCES

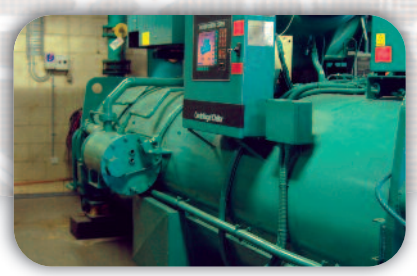
Unless noted, statistics are from the 2008-09 Occupational Outlook Handbook *at* ***http://www.bls.gov/oco*** *and other sources including* ***[1]http://www.salary.com.***

ABBREVIATIONS

*A = 2 - year associate's degree; B = 4 - year bachelor's degree; exp. = experience; CTE = career-technical education program; exp. = experience; FT = formal training program, usually short-term, offering a credential such as a certificate; hr. = hour; CTE = career-technical education program; M = B + 2 - year master's degree; MLS = B + 1-2 years in library science; MPH = B + 2 - year master's degree in public health; MSW = B + 2 - year master's degree in social work; OJT = on-the-job training; pref. = preferred; RN = registered nurse. *Average mid-range salary reported.*

High-Tech Life Support





Along the support services career pathway, you'll find some important behind-the-scenes jobs in the health services field – jobs for people who use technology to provide for the comfort, safety and well-being of patients and personnel in a health facility. For example:

- Biomedical equipment and maintenance personnel ensure that medical equipment and the facility's mechanical systems are in optimum working order.
- Materials managers make sure that their employers have a complete inventory of supplies and equipment on hand, from bandages to radiology machines.
- Professional housekeepers regularly inspect their facilities to ensure the the environment is clean and disinfected, chemicals are handled safely, and contaminated items are disposed of correctly.
- Central sterile processing personnel work to maintain infection control.
- And food service workers make sure that the items on each patient's tray reflect safe food handling and meet dietary needs.

Do you see yourself working in a support services field? Explore further, and you'll find that a high school diploma will lead to some entry-level jobs. Other jobs in support services require a certificate, an associate degree or a bachelor's or master's degree.

Continuing your education while you work will help you achieve higher-level jobs and more pay along the way. In fact, some employers will help pay for your tuition as long as you get good grades.

TECH CAREER RESEARCH

Biomedical engineers: **http://bmes.org**
Biomedical equipment technicians: **http://www.flahec.org/hlthcareers/bioequip.htm**
Dietetic technicians: **http://www.eatright.org/BecomeanRDorDTR/content.aspx?id=8144**
Health care central service materials managers: **http://www.iahcsmm.com**
Housekeepers: **http://www.ieha.org**
Infection control professionals: **http://www.apic.org**

KEITH ROGERS
HOSPITAL FACILITIES MANAGER

Keith Rogers is facilities manager for Portland Shriners Hospital in Portland, Oregon. He's responsible for all mechanical systems in the building, from elevators to toilets, and even the roof. He interacts with managers throughout the facility to make sure everyone's working conditions are optimal.

If a light goes out in an operating room, it's never a simple case of just changing a bulb. An electrician must be called. If the heating system in one wing quits working, Rogers checks it out and sends a climate control specialist. Sometimes a problem comes up as he walks in the door. Other times Rogers is tipped off by the overnight maintenance crew's reports, but it's his job to get the problem corrected.

"I think it's all about balancing the needs of the building versus the needs of the patients," Rogers says. "If you have people in the operating room, you have to keep the OR operating. Your challenges are a little harder based on that."

From the boilers in the basement, to the air conditioning on the roof, to a new gas system in the operating room, Rogers must stay aware of everything.

With so many systems, Rogers can't be an expert at all of them. His job is to make sure he has the right personnel available for any emergency.

However, preventing problems is as important as being able to fix one. Rogers uses a computerized preventive maintenance program that covers each system. Specifics are entered, and the program designs precise procedures for monthly, quarterly and annual inspections. The computer flags Rogers when it's time to begin the next maintenance routine.

"As technology changes, more and more computer systems enter into the job," Rogers explains. "If something happens, the computer can page me at home now."

A career like Rogers' is for someone who likes mechanical equipment and has a curiosity to dig deeper. Rogers started his career taking carpentry in high school and was a contractor before entering the Air Force. In the Air Force, he traveled the world as an air conditioning mechanic.

"There are constant challenges with this job," Rogers says. "When I hire people, I look for those who are eager to learn. There are different emergencies every day, sometimes all in the same hour. There's a lot of responsibility, and it pays off in a very interesting career." *Joan Rhine*


Keith Rogers

BUILDING SYSTEMS

A facility manager is responsible for all of the building's systems and uses regular and standardized inspections to keep the hospital running smoothly. Keith Rogers maintains:

- Heating and cooling – from patients to computers to medicine, the right temperature in the hospital is vital.
- Plumbing and electrical – from lights to pipes, maintaining services is critical.
- Structural – from the roof to the floor in the basement, the facility must be kept sound.

RAY FINCH
BIOMEDICAL TECHNICIAN

In a hospital, all the personnel are important. But for doctors and nurses at Portland Shriners Hospital in Portland, Oregon, having Ray Finch as a co-worker is critical. It's his job to ensure the success of every operation and that each X-ray and the next defibrillator they grab is ready to save a life.

Finch repairs and maintains all the medical equipment in the hospital and works with the people who use the machines. He loves the variety his career offers. From verifying calibrations to cleaning filters and changing hydraulic fluids, Finch never does the same job from one day to the next. And if something doesn't work, his fun is just beginning.

"I can go from working on a sterilizer to checking out something in the OR," Finch explains. "A lot of my job is troubleshooting – thinking logically. If this doesn't work, why not? It's challenging figuring out what went wrong."

"I do carry a pager for emergencies," Finch says. "But we also have backups for a lot of our critical equipment. So if something fails, another can be pulled out and used."

Finch asks questions of himself and others: Was it dropped? Did a component fall off? He reviews schematics, looks at maintenance records and checks out the power supply. Equally important, Finch must always let personnel know when he's fixed an item, not just replace it on the shelf and assume it will be found when needed.

In fact, history is kept on equipment from the day it comes into the hospital until it leaves Shriners. When the piece first arrives, it's entered into a computerized inventory system, and any routine or repair work done on an item is recorded. Inspectors come periodically to make sure all his records are maintained. Such record keeping affects the hospital's accreditation. It's one more responsibility Finch takes pride in handling correctly.

Finch's initial training came via an early military career, with six years in electronics. Students interested in a career in biomedical technology need to gain electrical training and be able to think logically. Finch says that computer knowledge is critical, too. As more and more computers are used in diagnostic machines, those making the repairs must gain even more expertise in understanding how all components interconnect. As a one-person shop, he has to keep on top of everything – making sure the next defibrillator is ready to save a life. *Joan Rhine*

Ray Finch

TECHNICAL EQUIPMENT

Biomedical technicians are responsible for repairs on a broad range of precision equipment like:

- Heart monitors
- Defibrillators
- X-rays
- CAT scanners
- Ultrasound equipment
- Electric wheelchairs
- Sterilizers

J. DARREL HICKS, B.S., R.E.H.
ENVIRONMENTAL SERVICES DIRECTOR


J. Darrel Hicks

At no time during the day does Darrel Hicks underestimate the importance of his job.

As director of environmental services and patient transportation for St. Luke's Hospital in the St. Louis, Missouri, area, Hicks and his staff have responsibility for keeping the complex's more than 1 million square feet clean and disinfected – a job that is essential to patient care and recovery.

It sounds simple, really – to provide a safe, clean and orderly environment for building occupants – but, in actuality, it's far from simple.

A typical day begins around 6 a.m. when Hicks makes a point to be in the office so he can be available to employees coming off third shift. Often, he works until 5:30 p.m. so he can also be available during the day to employees on first shift and finally those who are starting on second shift just before he leaves for the evening.

"I have 130 people that I am responsible for in five different departments," he said as he described what an average day could entail. "There are five medical office buildings, so an average day could involve a walking tour to inspect them. There is also the 500-bed hospital facility, so we could also walk the hospital to make sure employees have the tools necessary to do the job efficiently."

It's a lot of walking, he admits. But there's also plenty of time spent in the office dealing with budget and personnel issues, long-range planning and making sure that, for each project or building, the necessary staff, chemicals and equipment are allocated.

To accomplish all of this requires organization, flexibility and strong people skills. The latter is particularly invaluable when it comes to the variety of professionals with whom he interacts on a daily basis. These include not just his staff, but also infection control personnel, doctors, nurses, head nurses, department managers, supervisors from other departments and hospital administrators.

For anyone interested in a career in environmental services management, Hicks recommends getting an associate or bachelor's degree and building a strong foundation in the basics of math, science and English.

He takes pride in the services provided by his staff.

"We provide a very key service," he said. "Just imagine if housekeepers didn't show up one day and people had to bring toilet paper from home or empty their own trash. I shudder to think how long a hospital can remain open without housekeeping.

"I like being involved with something as important as cleaning and proving a safe clean environment for patients and their families," he continued. "I feel like we're an important part of patient care and helping with quick efficient recovery – which can only happen in a clean environment.

Sandra Moran

CAREER ADVANCEMENT

Like many occupations, housekeeping professionals have organizations that can help them advance in their careers. J. Darrel Hicks, B.S., R.E.H., is a good example. He was elected president of the 3,800-member International Executive Housekeepers Association (IEHA) for 2006-08 term. And he has attained the designation of Registered Executive Housekeeper (R.E.H.). To find out more about IEHA registration and certification programs, go to **http://www.ieha.org.**

NATALIE LIND, CRCST, CHL
DEPARTMENT MANAGER AND CONSULTANT


Natalie Lind

Natalie Lind had a long career as Central Sterile Processing Manager at Saint Cloud Hospital in Saint Cloud, Minnesota. On the job, employees like Lind, who work in central sterile processing, sterilize surgical instruments and assemble kits of instruments needed in operating rooms (OR), birthing units and emergency rooms. Their efforts help the health care teams work more efficiently and greatly reduce the risk of infection for patients.

"Working in a sterile processing department is an excellent career choice for people who are interested in science and the medical field, but not in one-on-one patient care. It also offers unique opportunities for career advancement. Because there are many job openings in this field and so few training programs available, high school graduates can often start as technicians and take part-time classes leading to certification as they advance up the ladder to management," Lind said. "Hospital salaries and benefits are usually good," she added.

Lind's career models her advice. She achieved Certification in Healthcare Leadership and also became a Certified Registered Central Service Technician through the International Association of Healthcare Central Service Materiel Management **(http://www.iahcsmm.org).** Today she is the association's educational director and a consultant in her field.

Lind's advice to students interested in this career is to:

- Take as many science classes as possible
- Become computer literate, because information is now computerized
- Visit a local hospital to shadow or talk with people in the sterile processing department

She also emphasizes that this is a good field for perfectionists who like to work with their hands and have incredible organizational skills, "because everything we do must be perfect every time." *Patty Williamson, Ph.D.*

TECH TALK

Support services professionals are familiar with many technical words. Can you match each of the following words with one of the definitions below? Answers appear on page 49.

A. Calibrate	D. Schematic
B. Mechanical	E. Repair
C. Component	F. Sterilizer

___1. Diagram of a machine or part
___2. To check measurements
___3. Part of a system or machine
___4. To restore, fix
___5. Operated by machinery
___6. A machine, such as an autoclave, used to kill pathogens

How to **BREAK** the **CHAIN** of **INFECTION**

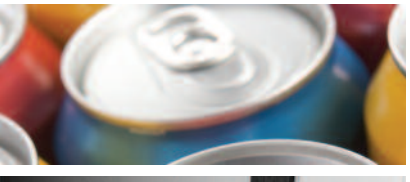
Infection is like the links in a chain, says Natalie Lind. You can imagine how it's spread. It has to have a host who passes it along, someone who has a cold, for example. It also has to have a host to receive it. That could be you if you take a sip from the infected host's soda pop can, according to Lind.

"Our job is to stop the pop can before it gets to the next person. Instead of a cold and a pop can, we look at blood-borne diseases and surgical instruments so infection isn't spread from one patient to another," she said.

Knowing how to break the chain of infection, Lind has some helpful tips you can use in your personal life.

Take care of yourself.

Get enough sleep and eat nutritious foods so you won't be receptive to bacteria. This is the first line of defense.

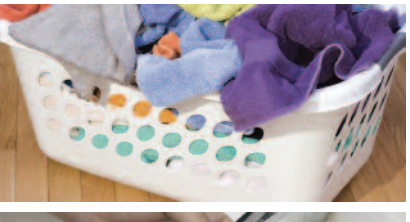


Recognize modes of transmission.

Sharing pop cans, bites of food from someone's fork or something someone has already tasted are great vehicles for cold and flu transmission.

Recognize you don't live in a clean environment.

A person who politely coughs into a hand may touch a doorknob or sit at a desk before you do. Then you touch the doorknob, or your pen touches the desk. Then you pick up finger food to eat, or you put your pen in your mouth. To break the chain of infection, wash hands often and before eating.



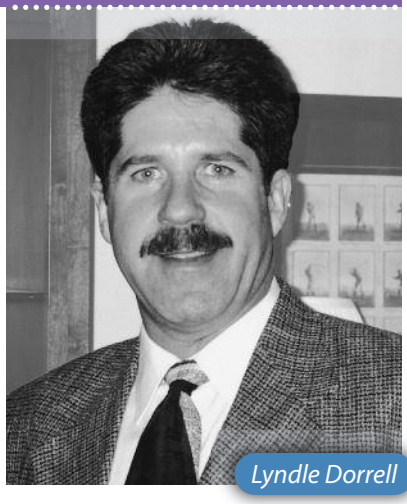
Clean up your environment.

When you clean your room, do you just shove clothing under the bed and make things look pretty? Or do you actually dust and wipe up floors and furnishings? What looks clean isn't necessarily clean.

Be considerate.

If you have a cold or sore throat, stay out of the breathing zone of others. Also wash hands frequently so you don't leave germs where you touch things.

LYNDLE DORRELL, RN, CHL, CHMMC, FEL
ADMINISTRATIVE DIRECTOR OF MATERIALS MANAGEMENT



Lyndle Dorrell

Lyndle Dorrell is administrative director of materials management for Cox Health Systems in Springfield, Missouri. His department is in charge of purchasing all the supplies and equipment used in the hospital, from bandages to pacemakers to radiology machines costing millions of dollars.

Supplies and materials used by patients make up about one-fourth of the cost of the hospital's budget. The price of everything Dorrell's department buys is going up and government reimbursement is going down. A major challenge is trying to maintain a reasonable cost for health care.

Dorrell's job doesn't end there. It's just beginning.

He also makes sure the items are **where** they are needed exactly **when** they are needed for patient care.

He deals with human relations and policy and procedure issues.

And he oversees several other departments, including sterile processing, the truckers and dock workers who take care of deliveries, and the mail facility, which handles more letters a day than most post offices.

"Everyone I deal with, whether it's a patient or a staff member, believes his or her request is of primary importance," Dorrell says. "I do the best I can to fulfill all of their needs."

Before achieving his present position, Dorrell worked as an OR and ER nurse, taught in a nursing school and was a nursing administrator. He enjoyed working directly with patients. Now his satisfaction is in knowing that his work makes a positive difference for a great number of people and plays a part in their healing.

Dorrell is certified in healthcare leadership and healthcare materiel management concepts by the International Association of Healthcare Central Service Materiel Management. He's also a fellow in central services, the highest distinction IAHCSMM awards to people in the profession. All of this means he has great advice for students.

> **"I do the best I can to fulfill all of their needs."**
> *-Lyndle Dorrell*

Dorrell says that an interest in science and the health care field and a sincere desire to help people are the most important factors for success in this career. Good communication skills, common sense and dedication to doing a good job are also necessary. "There are no specific education requirements for an entry-level job in materials management, but knowledge of medical terminology and computer technology are certainly helpful," he adds.

Dorrell suggests that teenagers interested in this field volunteer at their local hospital or ask to spend time shadowing personnel to see what they do every day. "There are so many career paths that support the personnel who deal directly with patients." *Patty Williamson, Ph.D.*

SHADES OF MEANING

In this article, you saw two apparently very similar words – *material* and *materiel.* There are, however, some differences. One is spelling, of course. Another is meaning. Still another is the route these words traveled to reach us today.

Material (accent on the second syllable) refers to matter or substances used to make something. *Materiel* (accent on the last syllable) refers to tools, equipment and supplies used for work.

Material came to us from Middle English *(circa* 1150-1470) and before then from the Latin words *materialis* and *materia. Materiel* came from the French word *matériel,* which has been traced to the early 1800s.

For other shades of meaning, review several dictionary definitions, both online and in print.

Reflections

As you've discovered, unseen but very important people are employed in health services. They're the people who follow the support services pathway. If you answer "yes" to a majority of the following questions, you may want to join them in contributing to excellent health care.

- ○ I'm interested in science, technology and engineering.
- ○ I want to help people by working with health-related technical systems.
- ○ I'm organized. When I get busy, I know the things I need to do first, second and third.
- ○ I don't mind doing detail work and double checking.
- ○ I'm observant and like to solve any problems I discover.
- ○ I don't mind learning how new equipment works or about new procedures and techniques. I like to learn.
- ○ I'd enjoy working on a team with other health professionals.
- ○ I have a strong sense of responsibility. People can depend on me.

Career Data

Occupation	Education	Salaries
Biomedical engineer	B	$ 73,970
Biomedical engineering/ equipment technician (hospital)	A	56,926 avg.[1]
Central services technician	HS, higher	30,568[2]
Housekeeper (hospital)	OJT	20,080 avg.[1]
Materials handler (nonhazardous)	HS	26,383[3]
Medical and health services manager	B, M, exp.	73,340
Medical equipment preparer	Some college	25,900[4]
Medical equipment repairer	A, B, OJT	40,580
Occupational health and safety specialist and technician	A, B	59,200
Transport technician (often requires EMT-1 certification)	FT	27,070

SOURCES

Unless noted, statistics are from the 2008-09 Occupational Outlook Handbook ***(http://www.bls.gov/oco);*** *other sources include* ***[1]http://www.24x7mag.com/issues/articles/2007-12_01.asp, [2]http://www.mayo.edu/mshs/cst-career.html, [3]http://www.salary.com*** *and* ***[4]http://onetonline.org.***

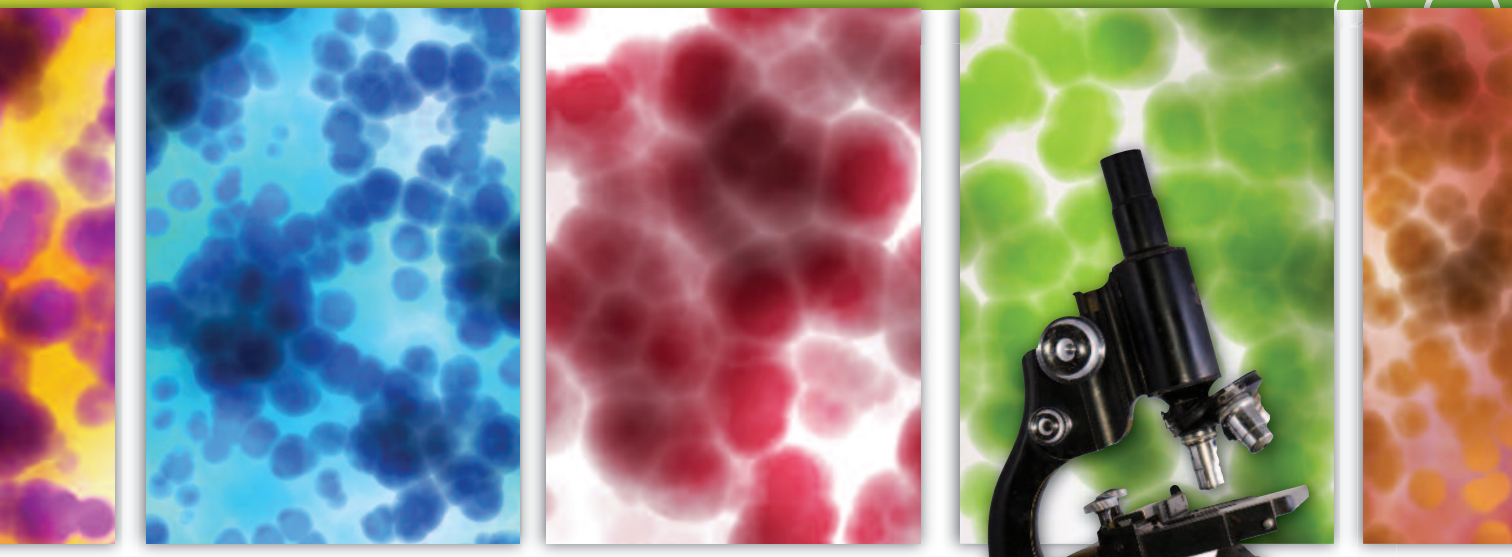
ABBREVIATIONS

A = 2 - year associate degree, avg. = average, B = 4 - year bachelor's degree, exp. = experience, FT = formal training, hr. = hour, HS = high school diploma, OJT = on-the-job training.

"TECH TALK" ANSWERS

See page 46.

1. D **2.** A **3.** C **4.** E **5.** B **6.** F



Biotechnology:

Research to improve life

New, lifesaving pharmaceuticals and therapies. Artificial implants that replace bones and teeth. Genetically modified foods resistant to disease. Treatments that help the body generate new tissue.

These exciting discoveries and more have been thought about, researched, created, developed, protected and marketed by thousands of men and women who work in biotechnology. Doctor Todd Gary is one of them.

The astrobiologist and biomedical researcher, whose career profile appears in this section, predicts exciting discoveries ahead. In the future, biomedical technology will enhance muscles and memory. Someday an 80-year old, maybe you, could be as physically and mentally fit as a 25-year-old, according to Gary. Who knows what other scientific adventures lie ahead?

Are you at low risk for cancer? Are you at high risk for Alzheimer's disease? How do you know? Someday, through genetic testing, a single blood draw will provide your physician with your complete medical profile. Testing like this can lead to early treatments and ensure a long, healthy life for everyone.

"Biotechnology is using life to create solutions to problems. It's fun, exciting and rewarding. It's fun because it's creative – everything you're doing is new. It's an exciting approach to helping the world, and it's financially rewarding," Gary added. You can be part of it all if you get involved in this high-tech field.

BIOTECHNOLOGY RESEARCH

American Institute of Biological Sciences: **http://www.aibs.org/careers**
American Association of Pharmaceutical Scientists: **http://www.aaps.com**
American Society for Microbiology: **http://www.microbeworld.org**
Bio-Link: **http://www.bio-link.org;** click on "Career Scenarios"
Biomedical Engineering Society: **http://www.bmes.org**
Biotechnology Industry Organization: **http://www.bio.org**
Pharmaceutical Research and Manufacturers of America: **http://www.phrma.org**
Society of Toxicology: **http://www.toxicology.org**

MARJOLEIN VAN DER MEULEN, PH.D.
BIOMEDICAL ENGINEER AND RESEARCH SCIENTIST

Marjolein van der Meulen discovered her career path while she was in high school in a rather serendipitous way. Her parents had been encouraging her to consider employment possibilities. Then one day, while watching *60 Minutes,* she saw a story involving the application of engineering to medicine.

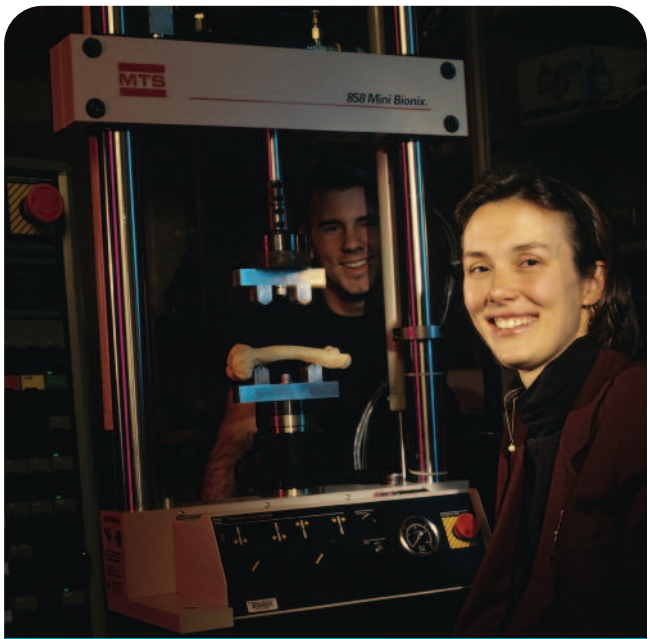
Today, she has a Ph.D. degree and is an associate scientist with the Laboratory for Biomedical Mechanics and Materials at the Hospital for Special Surgery in New York City. She also is an associate professor at Cornell University's Sibley School of Mechanical and Aerospace Engineering in Ithaca, New York.

Dr. van der Meulen's research focuses on bone mass acquisition. The answers to her questions – questions such as "How well can bones bear loads? – could one day help prevent osteoporosis. The bone disease involves the loss of bone tissue, often resulting in fractures of the hip, spine and wrist. Osteoporosis will affect over half of Americans ages 50 years and older, although individuals can be affected at any age, according to the National Osteoporosis Foundation.

"Fractures are mechanical events," explained Dr. van der Meulen, whose training is in mechanical engineering. "An osteoporotic fracture is a sign the bone couldn't bear loads."

In addition to making important contributions to society, a future engineer can count on interesting days at work. At the Hospital for Special Surgery, Dr. van der Meulen collaborates with MDs and other clinicians and scientists. At Cornell, she teaches classes, oversees graduate admissions and participates in lots of meetings. What does she like about the job?

"Engineers have made substantial and important contributions to health care," she adds. "Look at what's in a hospital – EKG machines, CT scanners. The diagnostic equipment found in a hospital is designed by engineers." *Mary Pitchford*



Dr. Marjolein van der Meulen (right) and her colleagues put bones and implants in the 858 Mini Bionix to test their behavior under different load conditions. The student in the photo is now a design engineer at the Hospital for Special Surgery.

ADVICE FOR STUDENTS

"Decisions made in high school impact your choices down the line," said Dr. Marjolein van der Meulen. "To be an engineer, one needs to take as much math and science as possible in high school. If one hasn't had a good background in these subjects in high school, it's much harder to consider an engineering career. Language and communication skills are increasingly important as well."

Young women who are problem solvers and interested in math and science are needed in engineering, according to Dr. van der Meulen.

"Engineering is about finding good solutions to problems. We want to get as broad a perspective as possible, which requires diverse representation.

"We live in an increasingly technical world, and engineering is a very flexible technical degree," she added. "You can work in engineering or in the financial world, for example. Most of our graduates in engineering eventually move into management."

CARL A. BATT, PH.D.
FOOD SCIENTIST


Carl Batt

Professor, researcher and food scientist Carl Batt has a lofty goal – to improve society and make our food supply safer. And, as principal investigator and director of the Batt Research Laboratory at Cornell University, Batt and his 30-member team of researchers, graduate students and undergraduate students are doing just that.

For example, part of his team is working to create recombinant anti-cancer therapeutics while others are creating portable sensor devices that can be taken into the field to detect bacteria in food. Both are possible thanks to nanotechnology.

Nanotechnology is the manipulation of matter that is a nanometer or less in size. To put that into perspective, a nanometer is so tiny that 10 million nanometers make up the length of one centimeter. In nano labs, researchers manipulate nanometers of matter, which act differently when they're that small, to create any number of new products that range from stain-resistant clothing to food packaging that changes color when the food is past its prime.

And portable devices like the ones Batt's lab is developing would be able to identify the presence of bacteria before food is packaged and shipped out.

"It's like CSI for food science," he said with a chuckle.

And like those CSI specialists, researchers and lab technicians require specialized training. Batt, who has a doctoral degree in food science, recommends getting a degree in physics, biology or chemistry.

According to the Bureau of Labor Statistics, scientific research and development services rely heavily on workers with extensive postsecondary education, although it is possible to work in laboratories with a college degree or specialized lab technician training.

Lab work, according to Batt, involves using high-tech (and often very expensive) equipment, documentation of research, and staying abreast of what other researchers in the field are doing. Strong understanding of math and basic scientific concepts are important, but the skill that Batt believes is most important, is patience.

"You need to have a huge amount of patience," he said. "Do not assume you're going to be successful if success is defined by your ability to solve a problem. Science is sort of trial and error. Most experiments fail not because you haven't done the experiment right, but because you can't predict with certainty what's going to happen."

Having said that, however, Batt firmly believes that the benefits far outweigh the "failures." He also believes there are plenty of reasons to go into food technology – including the fact that it's a "very hot field" that is likely to become even "hotter" as the need and desire for new products increase.

Sandra Moran

Recombinant anti-cancer therapeutics?

The phrase you see above refers to a research goal of Carl Batt and his team. They are recombining genes or pieces of genetic material to create anti-cancer remedies. Other researchers are working on recombinant therapeutics for diseases including:

- Cystic fibrosis, which prevents functioning of the lungs, pancreas and other organs of the body
- Diabetes, which prevents the body from processing sugar in the blood
- Hemophilia, which prevents blood from clotting

You'll find more information and a simple illustration of the process at **http://en.wikipedia.org/wiki/Recombinant_DNA**.

JIM KAPUT, PH.D.
NUTRIGENOMIST


Jim Kaput

What if you could walk into a store, provide a DNA sample from the inside of your cheek and have skin cream formulated specifically for your genetic makeup?

Sounds like science fiction, right?

Wrong.

Scientists like Jim Kaput are doing work in genetics that could one day allow each of us to use our DNA to personalize everything from face creams to diet regimes.

Kaput, a researcher at the University of California at Davis and president of the Chicago-based company, NutraGenomics, admits there are all sorts of possibilities for DNA research. But, as a nutrigenomist, he is dedicated to using his research to help others.

He explains his work, also known as nutritional genomics, like this:

Everyone has his or her own unique DNA. Your DNA determines what diseases you can develop, your body type and what foods you need to be healthy. Because each person is different, there is not a "one size fits all" diet that works for everyone. Most foods will keep everyone healthy for a short time. However, long-term health depends on having foods that fit your genetic profile.

The same is true for entire groups of people who have similar DNA. Because of geography, adaptation and culture, people develop traditions of eating foods specific to the region. Over time, their descendents, through the genes they inherit, begin to rely on certain diets.

What happens when those diets change? Kaput explains, using a real-world example from his research.

Groups in the United States donate food to countries like Ethiopia. The problem is that the donated food is based on a U.S. diet and geared toward U.S. genetics. It may not have the right amounts of vitamins and dietary fat for people in Ethiopia. As a result, the people eating this food begin to see an increase in diet-related diseases such as diabetes.

Enter nutrigenomics.

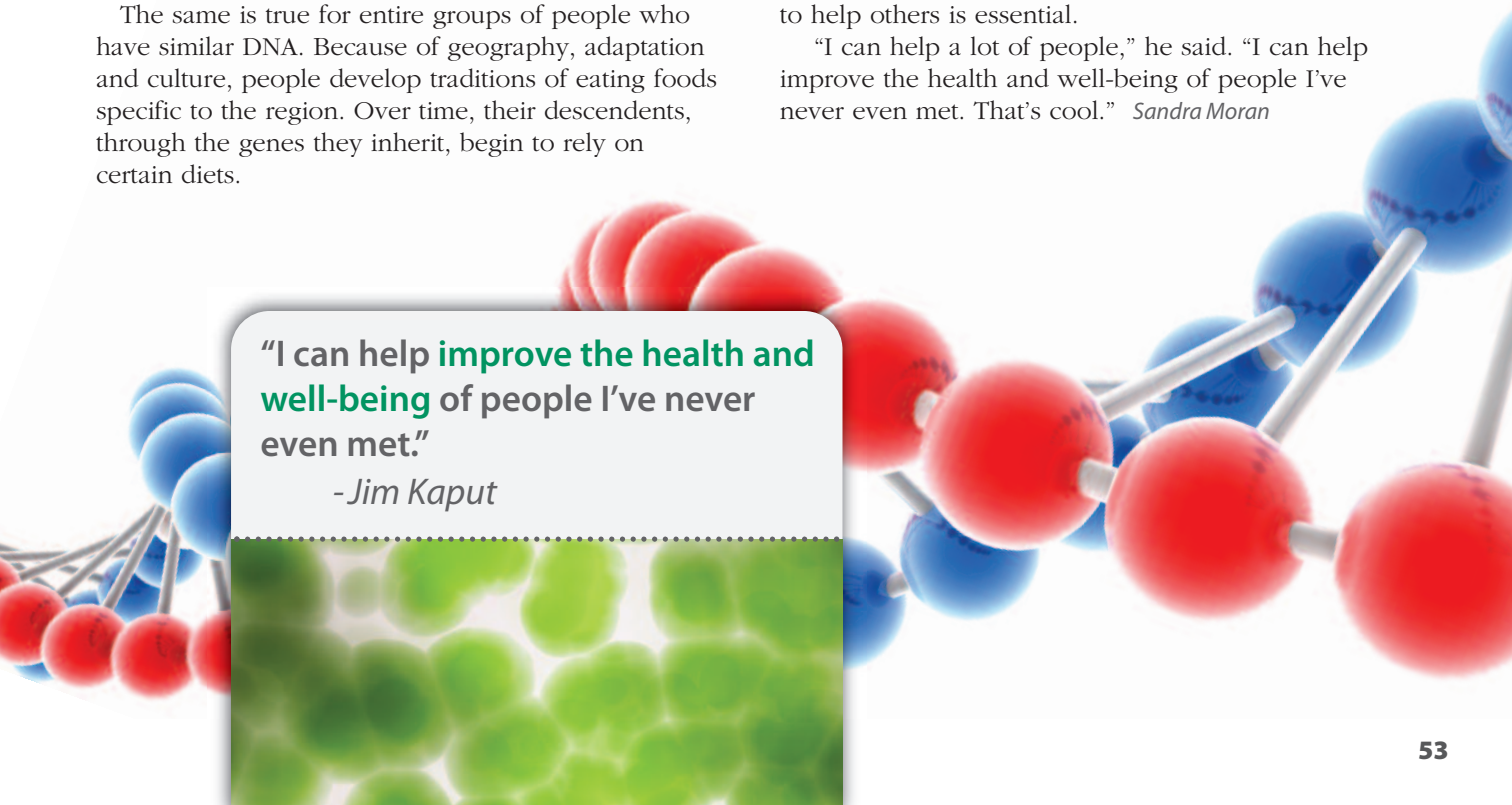
Armed with a computer and a laboratory full of high-tech equipment, Kaput works with universities, physicians, dietitians and government agencies to create genetically personalized diets.

By analyzing DNA samples, Kaput and other nutrigenomicists can identify potential problems or nutritional needs. Then they develop an individualized diet to address those issues.

Kaput said he wasn't trained in genetics. He earned his Ph.D. in biochemistry. But he believes that people trained in one field of study often bring insight to other fields of study. Either way, an advanced degree is necessary to do what Kaput does, although it is possible to work in laboratories with a bachelor's degree or specialized lab technician training.

Kaput stresses the importance of a good educational foundation based in math, science and English. He also believes a curiosity about the world and a desire to help others is essential.

"I can help a lot of people," he said. "I can help improve the health and well-being of people I've never even met. That's cool." *Sandra Moran*



ALSHAD 'AL' LALANI
BIOCHEMIST


Alshad 'Al' Lalani

Scoping out a cutting edge career? Enjoy science and saving lives? Then look closely at biochemistry, like Alshad 'Al' Lalani did. He's associate director of translational medicine at Regeneron Pharmaceuticals, Inc., in New York.

Lalani, who has also worked at other research companies, has a Ph.D. in biochemistry. He specializes in cancer research and development of medicines to treat the disease. A typical day for researchers like him involves running experiments, but starts with extensive reading.

"New information is found continuously," Lalani explained. "The way scientists communicate is through scientific journals."

Lalani studies articles relating to cancer research, using this data to gain insights and form hypotheses. He and his team meet to discuss ways to block cancer pathways. They review journal articles, then go into the lab to work with cells. When projects look good, they tweak parameters to improve performance and test the drugs.

This entire time, they ask questions. Is the drug:

- Working as expected?
- Blocking cancer growth?
- Causing unwanted side effects?

Once research is complete, another set of scientists takes the project for additional testing.

Trained in Canada, Lalani started with a B.S. degree in cell biology. Between his bachelor's and master's degrees, he worked in internship programs focused on AIDS research and clinical trials, considering this early training crucial.

"I recommend internship programs to anyone wanting a career in life science," he said. "You get paid in some, others you do for free, but the training is invaluable. You learn whether you'll really like working in the field."

Following his master's with more research work, Lalani quickly realized he wanted to be where his supervisors were – leading teams. That meant going back to school for an M.D. or a Ph.D.

He applied to both medical and graduate schools, and, while his grades were good, competition to get into doctorate programs is fierce. Experience made the difference, eventually gaining him acceptance to both medical and graduate schools. His Ph.D. in biochemistry, a rigorous program, with a specialty in virology and broad experience in immunology, opened many doors. During his fellowship, a post-grad situation where Ph.D. students choose specialties, the biotech industry route met Lalani's goals.

But science backgrounds offer many options. You can:

- Set policy by joining the FDA (U.S. Food and Drug Administration)
- Spread important information as a scientific writer
- Teach the next generation of researchers as a science teacher or professor

The commercial route allows Lalani to see direct results with patients.

"This career gives a rush when things work out," Lalani said. *Joan Rhine*

ROBERT RUTSCHMAN
RESEARCH SCIENTIST

Ever wanted to help save the world from an incredible menace? You don't have to be a superhero. Just look at a microbiology career, like Robert Rutschman, a research scientist in the Department of Infectious Diseases at St. Jude Children's Research Hospital in Memphis, Tennessee.

"I've always wanted to know how things worked."
-Robert Rutschman

While based in the U.S., Rutschman's research impacts populations around the world. He works with teams of scientists to obliterate diseases like tuberculosis, which kills more people worldwide than any other infectious virus.

As an immunologist, he's helped discover ways to clarify complex immune system activities, leading to better treatments for heart disease. With a master's degree in cell biology and immunology, his job is to constantly ask questions and look for answers.

"I've always wanted to know how things worked," Rutschman explained. "As a kid, it was a carburetor. Now, it's diseases and the human body."

A typical day involves working on and evaluating projects for both short- and long-term goals. Rutschman said it's important to ask fundamental questions – even if those questions do not lead down the expected path. He then plans a series of experiments to determine the answers, often working under tremendous time constraints.

"This is a very competitive environment," he said, "with hundreds of labs worldwide that may be working on the same problem you are."

Creativity is a key trait for a scientist, an ability to look outside the box. Other qualities include persistence, perseverance and skepticism. Scientists communicate constantly: on teams, with colleagues in other labs and through journal texts. One of the challenges, Rutschman said, is that scientists as a group are extremely hyper-skeptical about everything, so it's crucial to be sure of yourself and your abilities.

Science and math studies are important. Developing communication, writing and leadership skills also gives future scientists an edge. Most of all, develop a healthy curiosity in the world, how things work together and impact each other, Rutschman said.

"My goal is to identify systems responsible for destroying invading bacterial and viral pathogens," Rutschman said. "Our lab wants to understand exactly how those cells are turned on and off."

They may not fly through the air like fictional superheroes, but research scientists are saving the world every day. *Joan Rhine*

"WORD RESEARCH" ANSWERS
See page 58.

1. organism
2. pollute
3. procedure
4. sample
5. poisonous
6. separate

TODD GARY, PH.D.
ASTROBIOLOGIST AND EDUCATOR

Dr. Todd Gary at space camp.

For much of his career, Dr. Todd Gary has worked in biomedical research. "Solving human health problems is satisfying emotionally, professionally and financially," he said. But he didn't start at the top.

When he was a student at Mar Vista High School in Imperial Beach, California, Gary tutored his mother and her classmates in science. They were nursing students in an associate degree program at Southwestern Community College, Chula Vista, California. Today, they're all practicing RNs, he said.

Gary also received his associate degree from Southwestern before earning his bachelor's degree from Point Loma College in San Diego, California. At Point Loma in Michael McConnell's laboratory, he researched how the virus that kills *Pseudomonas aeruginosa* works. *P. aeruginosa* is a bacterium that causes problems for people with cystic fibrosis and other serious diseases. (See **http://www.pseudomonas.com,** and click on the cystic fibrosis link.) "How can we learn from that?" was the question.

"The answers are part of a whole field of science called virus therapy – using viruses against bacteria that cause people problems," Gary explained. "Viruses can kill tuberculosis, strep throat and influenza – bacteria that are harmful to people. Bacteria can become resistant to antibiotics, but they can't become resistant to viruses specific to a bacterium."

After graduation from Point Loma, Gary went straight through to a Ph.D. degree at Vanderbilt University in Nashville, Tennessee. Vanderbilt paid all of his tuition ($30,000 a year at that time), plus gave him $10,000 a year to live on, "because they needed scientists so badly," Gary said.

At Vanderbilt, Gary worked for Gisela Mosig **(http://www.mc.vanderbilt.edu/reporter/index.html?ID=2484).** While there, he studied how new strainsof viruses evolve at the DNA level. He was the first scientist to do that, he noted.

After earning his Ph.D., Gary received a medical fellowship at Vanderbilt University Medical Center. In David Robertson's laboratory, he examined the DNA of humans who couldn't make adrenaline. One of the body's neurotransmitters, adrenaline is a "fight or flight" hormone produced in the adrenal gland. It increases heartbeats, blood flow and breathing needed for exercise or to run from danger. Their work helped advance understanding of the human nervous system, which can't work without neurotransmitters.

Completing his fellowship, Gary joined the chemistry and molecular biology faculty at Vanderbilt. He taught the Introduction to Human Gene Therapy course, which received national recognition, and worked with Mel Josten on an exciting student outreach program, Vanderbilt Student Volunteers for Science **(http://studentorgs.vanderbilt.edu/vsvs/).**

Then, Tennessee State University (TSU) in Nashville received a $5 million grant to systematically change the way science was taught in the elementary and middle schools. Gary, who was hired as a scientist in residence, worked with 3,000 teachers in the program. And his career flourished.

Today, Gary teaches in the biology department at TSU and directs educational and research programs. He runs space camps with funds he received from the National Aeronautics and Space Administration **(http://www.nasa.gov).** Students at the camps get to meet astronauts and NASA researchers. Gary also

trains high school teachers in biotechnology. And he works with the Tennessee Department of Education on teaching standards for biotechnology courses.

In all, a typical day for Gary is writing, networking and teaching. "I'm writing proposals to support the education and research I'm involved in and writing publications to let the world know what I'm doing. In research, you have to get people to believe in your ideas and fund your ideas. If you can think of something that might solve problems in the future and get someone to fund your ideas, you can do whatever you want to do," he said.

A day's work also includes "networking with fellow researchers and colleagues and communicating with my staff, university administration and school district officials," he added. "During space camp, I'm communicating with teachers, parents and future astronauts. My teaching involves teacher training, college courses and presentations around the country. I usually travel every other week," he continued.

On top of that, Gary does research in the area of astrobiology, working with Greg Henry, an astronomer at TSU who directly detected the first planet outside our solar system.

As he described all of his experiences and posed future problems to be solved, Gary said, "I can't imagine a career in any other field that's more exciting." *Mary Pitchford*

Dr. Todd Gary (fourth from right) and Tennessee State University astrobiology laboratory researchers meet with Dr. Baruch S. Blumberg (far right). Blumberg won a Nobel Prize for his work to discover new mechanisms for the origin and dissemination of infectious diseases. Learn more about him at ***http://www.nobelprize.org/nobel_prizes/medicine/laureates/1976/blumberg-autobio.html****. Learn more about the Nobel Prize at* ***http://nobelprize.org****.*

DO YOU WANT TO BE A RESEARCHER?

TIPS FROM DR. TODD GARY

In high school ...

"If you want to go anywhere in science, you need to work for the high school newspaper," said Dr. Todd Gary. You need to learn how to write clearly, concisely and quickly to write grants. 'Publish or perish' is part of a successful scientist's job description. The 'publish' part is writing. Your career is not going to depend on taking a multiple choice exam."

In college ...

With degrees in science, you can begin as a lab assistant and become director of a lab. However, in addition to science, Gary advises, "The more you can expand your background, the more different areas you can study, the better careers you will have." He provided several examples:

"If you have a bachelor's, master's or higher degree in science or engineering, plus a master's in business administration, you can direct companies. Or you could become a planner who works to predict where research should be conducted in areas such as public health and agriculture.

"In biotechnology, intellectual property provides the biggest profit for a company. Intellectual property is protected by patents that are handled by patent lawyers. One recent patent sold for $1 billion. If you have a degree in science or engineering and a degree in law, you can be a patent lawyer. They make three times as much as a regular lawyer. You also can get into biotech patent law with a year-and-a-half to two-year paralegal certificate program.

"If you have a science, engineering or psychology degree, you can go into sales and marketing. In fact, if you have an associate degree and pick up science and business classes, you can go into tech sales, where you can make three or four times the salary of an average salesperson."

Other careers for people who expand on their science backgrounds include, according to Gary, education, writing about research discoveries or product safety, science-related broadcasting like NOVA, sports regulation related to performance enhancement drugs and more.

Todd Gary

One last tip: Work hard to get good grades. Gary said, "As soon as you get your bachelor's degree, your master's and Ph.D. will be completely paid for in science if you're accepted into a program." It happened for him.

WORD RESEARCH

Research each word in a health science context, circle its synonym, and check page 55 for answers.

1. **Bacterium** (n.)

disease | medication | organism

2. **Contaminate** (v.)

touch | clean | pollute

3. **Protocol** (n.)

procedure | data | chaos

4. **Specimen** (n.)

trial | sample | component

5. **Toxic** (n.)

benign | poisonous | allergenic

6. **Isolate** (v.)

separate | integrate | assimilate

Reflections

Today's drug discoveries aren't miracles. They're the life's work of scientists, engineers, technicians and others whose research saves or improves the lives of millions of people. Would you like to join them? Check and see if you have a research kind of mind.

- ○ I'm really interested in science. I don't mind doing lab work, taking notes and writing about my discoveries.
- ○ I'm willing to pursue years of higher education because I like to learn.
- ○ I'm curious, observant, organized and don't mind double-checking details.
- ○ Problems and challenges fascinate me. I'm willing to analyze a lot of information in order to find solutions.
- ○ I don't mind learning and working with new equipment, procedures and techniques.
- ○ I'm good at working by myself or with others on a project.
- ○ I have a strong sense of responsibility, and I'm willing to work till I get results.

Did you answer "yes" to most of these questions? You may want to pursue research-related jobs at pharmaceutical companies, research hospitals, universities and federal government agencies.

Career Data

Occupation	Education	Salaries
Biological scientist, including biochemist and biophysicist	Ph.D.	$ 76,320
Bioinformatics specialist	B, M	76,000[1]
Biomedical engineer	B	73,970
Biomedical engineering technician	A	49,080 - 59,757 avg.[2]
Biostatistician	M, Ph.D.	65,720
Chemist	B, M, Ph.D.	59,870
Medical and clinical laboratory - technologist - technician	 B A	 49,700 32,840
Medical equipment repairer	A, B, OJT	40,580
Medical scientist - pharmaceutical mfg. - research and development	Ph.D, MD	 82,640 71,490
Microbiologist	Ph.D.	57,980
Quality assurance specialist I (entry level, pharmaceutical industry)	B	43,897 - 55,862 avg.[2]
Regulatory affairs specialist	B, exp.	51,131 - 60,410 avg.[2]
Science technician - biological - chemical	A, B	 17.17/hr. 18.87/hr.
Toxicologist (pharmaceutical industry)	Ph.D.	57,297 - 83,916 avg.[2]

SOURCES

Unless noted, statistics are from the 2008-09 Occupational Outlook Handbook ***(http://www.bls.gov/oco);*** *other sources include* ***[1]http://www.24x7mag.com/issues/articles/2007-12_01.asp*** *and* ***[2]http://www.salary.com***

ABBREVIATIONS

A = 2 - year associate degree in science; avg. = average; B = 4 - year bachelor's degree in science; hr. = hour; M = B + 2 - year master's degree in science; MD = B + 4 years medical school + 3 - 8 years internship and residency; mfg. = manufacturing; Ph.D. = B + 5 - 7 years additional study.

HOSA

Making the Connection

Middle and high school students face many important life decisions. Among them are "What kind of career do I want to pursue?" and "How will I be able to succeed?"

For those of you who are struggling with making career decisions – HOSA has an invitation for you. There is a world of opportunity in health and medical careers, and HOSA can help you make the connection to a future health care profession. Join HOSA and become a part of the health care workforce pipeline.

Health Services: Where the Jobs Are

The Labor Department's Bureau of Labor Statistics projects that the health services industry will add 3 million new jobs, or 21.7 percent of all wage and salary employment, between 2006 and 2016. Nine of the 20 fastest-growing occupations will be in health care. Now more than ever, the health care industry needs young people to consider a career in health care, and HOSA can show you how.

HOSA: Connecting with Health Services

HOSA is the largest national student organization in high schools whose goal is to promote career opportunities in health care. HOSA's strong health care connection provides unique opportunities for students who may wish to consider a health care career.

In addition to exposure to a variety of health careers, HOSA membership helps the future health care professional develop a variety of skills that are essential in the 21st century workforce. Among those are the development of leadership and teamwork skills.

As a student-led organization, HOSA gives members the opportunity to take control of the HOSA chapter and assure the chapter's success. The chapter is successful when individual chapter members take responsibility for chapter projects, activities and contributions to the health care community.

Successful HOSA chapters understand the power of teamwork in achieving chapter goals. In the real world, it takes a variety of skilled health care team members to serve the needs of the patient. Experience as a member of the HOSA team provides a great start to an exciting health career.

For more information about HOSA's role promoting career opportunities in health care, visit HOSA's career center at **http://www.hosa.org.**

Story and photos are courtesy of HOSA.

Connecting with Health Careers

HOSA proves unique opportunities for future health professionals.

1

Competitive Events

HOSA's national competitive events program offers 50 events that provide a motivating format for health career learning. HOSA members compete against members from other schools and states in events such as:

- EMT
- Medical Reading
- Health Education
- Biomedical Debate
- Practical Nursing
- And more

2

Educational Symposiums

HOSA's National Leadership Conference offers multiple workshops for HOSA members, presented by members of the health care community. Past topics have included:

- Pathophysiology of Trauma
- The Power and Joy of Humor in Medicine
- Flight Nursing
- Legal Aspects of Clinical Management
- Anatomy in Clay
- And more

3

Service Learning

HOSA provides chapter members with a variety of volunteer opportunities in the local community. HOSA chapters often help with bloodmobiles, visit senior citizens and participate with local hospice organizations. They jump rope for the American Heart Association, take a memory walk for the Alzheimer's Association and work with the Special Olympics.

4

Working with Professionals

HOSA members have an opportunity to work with health professionals on a daily basis. The HOSA advisor is often a health care professional, chapter meetings involve health professional guest speakers, and health professionals take an active part in teaching members or judging HOSA events.

HOSA members have a unique opportunity to meet, talk with and learn from today's health care professionals in preparation for their future health careers.

Your **Career** begins in **High School**

You've done your research. Are you still interested in a career in the health science career cluster? High school is the right time to start:

- Visit with your school counselor, librarian and teachers. Ask for career literature and advice on courses and programs.
- Ask if your high school has a career-technical education program for students interested in health careers. Find out more about it, and let your school counselor and health occupations teachers know that you're interested.
- Join the Health Occupations Students of America. (See the HOSA story on pages 60-61.)
- Explore more with a part-time job or internship.
- Sign up for the heavy-duty classes, and work hard to get good grades. Suggestions include:
  - Four years of English
  - Two years of algebra, one year of geometry, and one year of trigonometry and/or calculus
  - One year of biology, one year of chemistry, one year of anatomy and physiology, and one year of physics (Advanced placement classes and dual high school-community college enrollment credits are a plus.)
  - Four years of social studies (Requirements and other choices include geography, world history, American history, economics/government, psychology and sociology.)
- Strive to maintain good grades, good attendance and a good record if you want to be accepted in a health careers program and become employed in a health care environment. No employer wants someone with a bad record working with patients.

Access **http://www.careertech.org** for more information. Then click on "Resources for Career Clusters," then "Plans of Study," then "Health Science."

SAMPLE HIGH SCHOOL PLAN OF STUDY

	FRESHMAN	SOPHOMORE	JUNIOR	SENIOR
1st Period	English I	English II	English III	English IV
2nd Period	Algebra I	Geometry	Algebra II	Trigonometry or Calculus
3rd Period	World History	American History	Government/Economics	Psychology/Sociology
4th Period	Biology	Chemistry	Physics	Anatomy and Physiology/ Other Lab Science
5th Period	Health/PE	Fine Arts	Health Science I	Health Science II
6th Period	Foreign Language I	Foreign Language II	Technology Applications	Co-op/Other Work-Related Program

Consider **Postsecondary** Education

High school can be your first step on your pathway to a future health career. With a high school diploma, some employers will provide on-the-job training for several entry-level jobs, such as dental assistant, nursing aide or pharmacy technician, if you can pass an entrance test.

If you checked out the Career Data charts in this publication, however, you very likely discovered that career advancement and higher earnings require further education. In fact, a postsecondary certificate or an associate, bachelor's or higher degree are "must-haves" for many entry-level positions in health services. Military training is an option, too.

And careers that require certification or a license, such as nursing, medicine and others, also entail ongoing continuing education. For example, radiologic technologists must complete 24 hours of continuing education every two years in order to be recertified.

So if you see yourself in a health career, consider postsecondary education.

POSTSECONDARY EDUCATION OPTIONS

MILITARY TRAINING

- Dental specialist
- Dentist
- Dietitian
- Health care specialist
- Hospital food service specialist
- Medical care technician
- Medical laboratory specialist
- Medical service technician
- Operating room specialist
- Optical laboratory specialist
- Optometric technician
- Optometrist
- Patient administration specialist
- Physical and occupational therapist
- Physical and occupational therapy specialist
- Preventive medicine specialist
- Pharmacy specialist
- Radiology specialist
- Physician assistant
- Physician
- Registered nurse
- Speech therapist
- Surgeon

COMMUNITY COLLEGE

One- to two-year programs leading to a certificate or two-year programs leading to an associate degree

- Biomedical engineering/ equipment technician
- Cardiovascular technician
- Certified nursing associate
- Dental hygienist
- Electroneurodiagnostic technologist
- EMT/Paramedic
- Medical assistant
- Medical and clinical laboratory technician
- Medical equipment repairer
- Medical records and health information technician
- Occupational health and safety technician
- Physical therapy assistant
- Registered nurse
- Science technician (biological, chemical)
- Social and human services assistant

COLLEGE/UNIVERSITY

Programs of four or more years leading to a bachelor's, master's or professional degree (e.g., MD)

- Audiologist
- Athletic trainer
- Biomedical engineer
- Epidemiologist
- Medical and clinical laboratory technologist
- Medical and health services manager
- Medical librarian
- Medical scientist
- Microbiologist
- Music therapist
- Optometrist
- Pharmacist
- Physician or surgeon
- Quality assurance specialist
- Radiologic technologist
- Registered nurse
- Social worker (medical/public health)
- Speech-language pathologist
- Toxicologist

NOTE: To find out more about education needed for a variety of health-related careers, go to ***http://www.bls.gov/oco,*** *to professional association websites and to the websites of community colleges, colleges and universities. To find out more about military training, go to* ***http://www.goarmy.com/JobSearchPre.do*** *and* ***http://www.todaysmilitary.com/military-careers.***

PLAN FOR YOUR EDUCATIONAL FUTURE

This handy timeline will help!

Eighth Grade

Draft a four-year high school plan with advice from your parents and school counselor. Choose college prep courses that meet state requirements, and use electives for career exploration.
Study hard to get good grades throughout your school years.

Ninth Grade

Begin now to review your four-year plan with parents and school counselor. Update it every year.
Create a portfolio to collect report cards, activities, honors and awards, and volunteer and work experiences.
Get involved with career-related student organizations and continue your involvement throughout your school years.
Consider career-related high school programs.
Think about career choices and attend career fairs.
Think about education after high school and how to pay for it.

Tenth Grade

Explore education options after high school and attend college fairs.
Narrow career and postsecondary education choices.
Take practice college entrance tests, such as the PSAT **(http://www.collegeboard.com/student/testing/psat/about.html).**
Begin to make financial plans.
Apply for a career-related summer job or enrichment program.
Update your portfolio.

Eleventh Grade

Check to see if you're meeting graduation requirements.
Schedule college entrance tests, such as SAT and ACT **(http://www.collegeboard.org** and **http://www.act.org).**
Schedule interviews with admissions personnel and make on-site visits to schools or training facilities.
Apply for a career-related summer job or enrichment program.
Practice writing information for postsecondary applications (usually online).
Update your portfolio.

Twelfth Grade

Check again to see if you're meeting graduation requirements.
Compare and contrast education and financial options.
Apply to postsecondary programs of your choice, providing any needed recommendations, fees, transcripts and requests for financial aid.
Complete the Free Application for Student Financial Aid online **(http://www.fafsa.ed.gov)** and any other financial forms.
Review acceptance letters from schools and any scholarship and financial aid offers.
Select the program you like, notify the institution in writing with your deposit attached, have your high school forward final transcripts and notify other programs that you've made another choice.
Complete financial arrangements ...

... AND YOU'RE ON YOUR WAY!

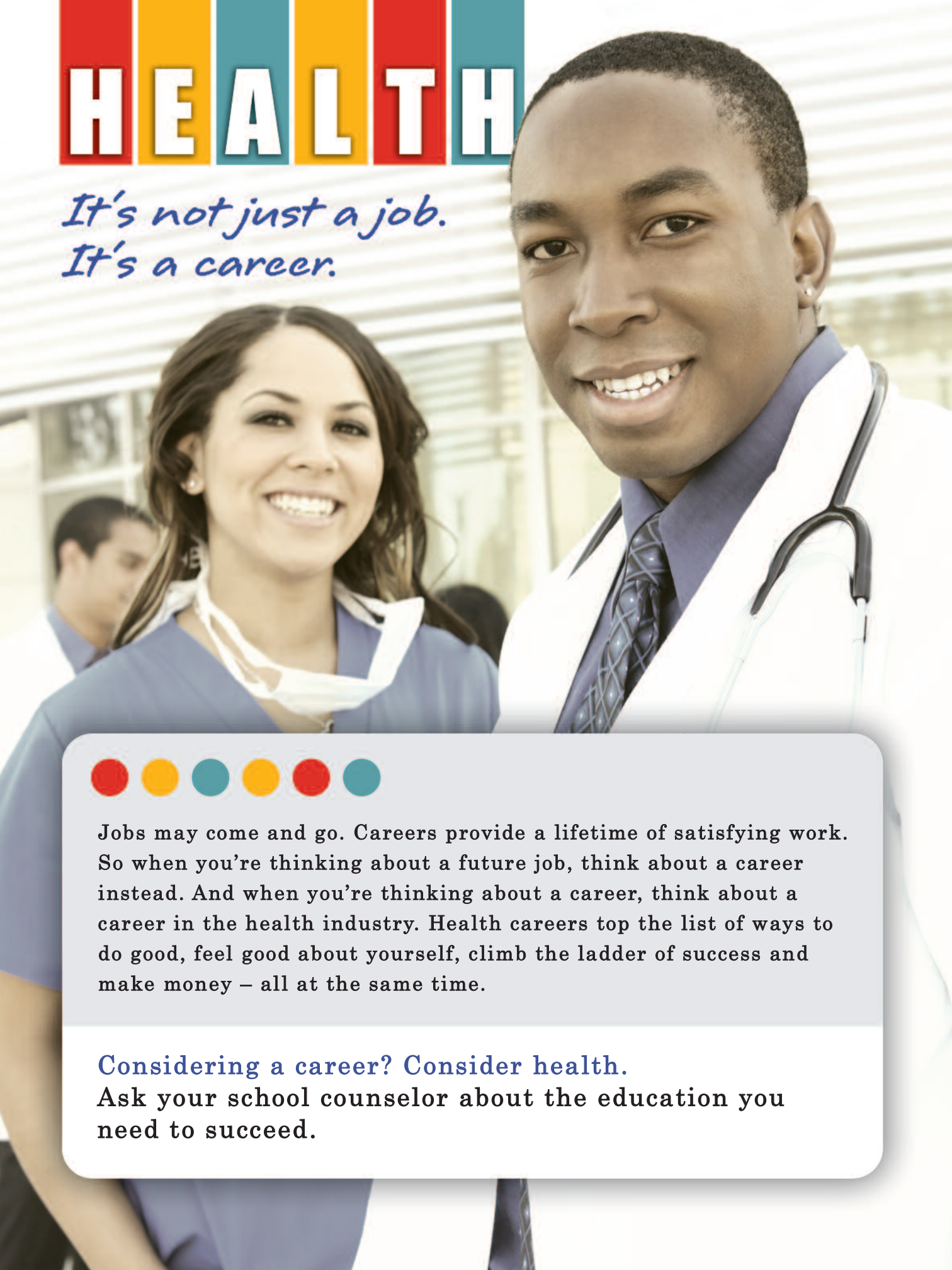
NEED SCHOLAR DOLLARS?

Not many people have a free ride to college. So if you need scholar dollars, take the following steps to find financial aid:

- Start with the government. Go to **http://studentaid.ed.gov.** Be sure to click on "FAFSA." It's the Free Application for Federal Student Aid (FAFSA) mentioned under "Twelfth Grade" in the planning timeline.
- Make an appointment with your school counselor and financial aid directors at schools you'd like to attend. They can tell you about aid available from your state, the school itself and other sources. Some schools' websites provide this information.
- Some hospitals and other health agencies offer training programs, scholarships or financial aid for education. For information, call the human resources department or go to the website.
- Go to **http://www.fastweb.com** and **http://www.finaid.org.** These sites have leads to financial aid and scholarships.
- Avoid scams by reviewing the information at **http://www.finaid.org/scholarships/scams.phtml.** You don't have to pay anyone for scholarship and financial aid information.

HEALTH

It's not just a job.
It's a career.



Jobs may come and go. Careers provide a lifetime of satisfying work. So when you're thinking about a future job, think about a career instead. And when you're thinking about a career, think about a career in the health industry. Health careers top the list of ways to do good, feel good about yourself, climb the ladder of success and make money – all at the same time.

Considering a career? Consider health.

Ask your school counselor about the education you need to succeed.

●●■ career communications, inc.
6701 West 64th Street, Suite 210
Overland Park, KS 66202